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DEPARTMENT OF MINES.

MINING REVIEW

FOR THE

HALF-YEAR ENDED JUNE 30th, 1920.

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Compiled by LIONEL C. E. GEE, S.M., Chief Registrar and Recorder, Department of Mines,

ISSUED UNDER THE AUTHORITY OF THE

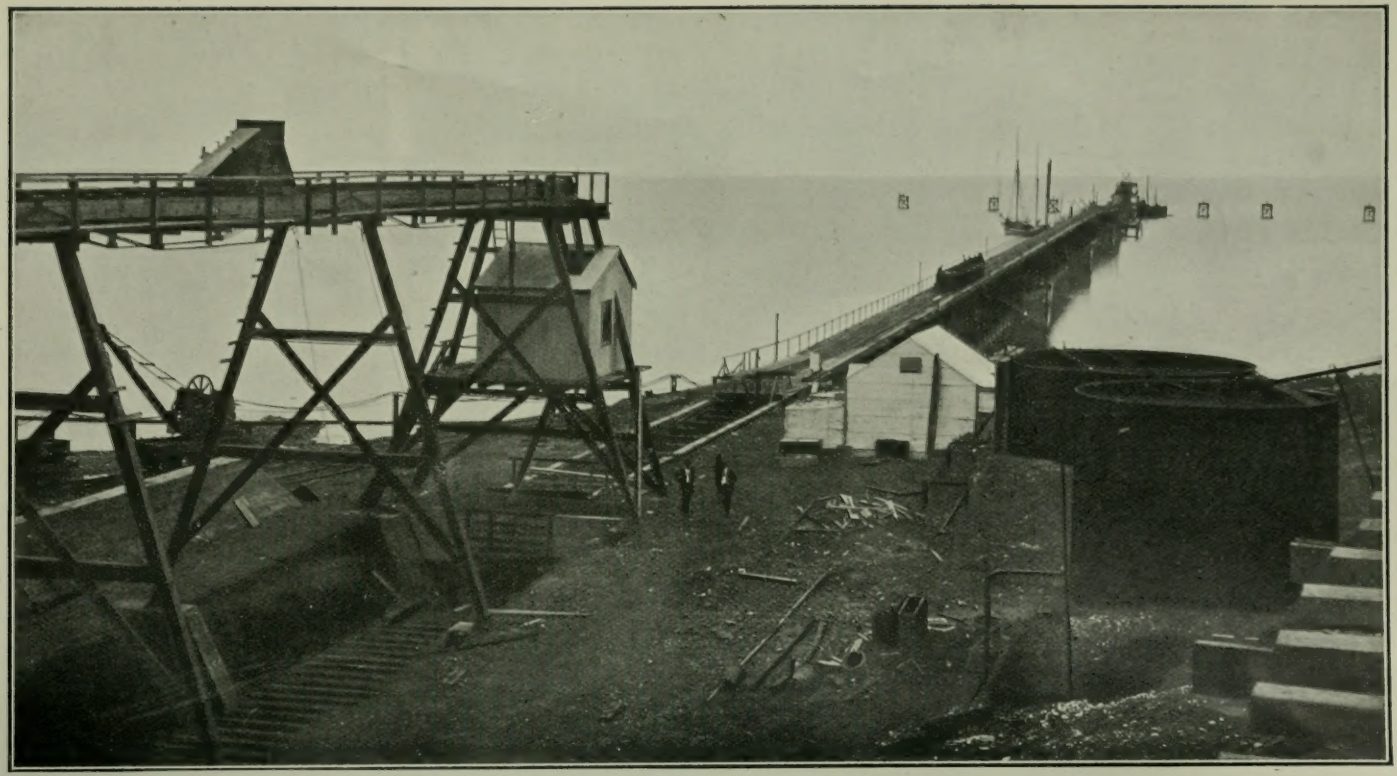
HONORABLE T. PASCOE, M.L.C.,

Minister of Mines.

DEPARTMENT OF GEOLOGICAL SCIENCES,
UNIVERSITY OF TORONTO

Adelaide:
R. E. E. ROGERS, GOVERNMENT PRINTER, NORTH TERRACE.

1920



Hummocky Point, 2,200ft. Jetty, showing end of Ore Conveyors.

South Australia.

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MINER'S RIGHTS AND PRIVILEGES THEREUNDER.

A miner's right is obtainable at the Department of Mines, Adelaide, also at the issuing stations in the various mining districts, at a cost of 5s.; it is in force for one year from the date of issue, and may be renewed at any time during its currency for another term of one year on payment of 5s. The holder is authorised to prospect on any mineral lands for any metal, mineral, coal, or oil, and to peg out (of the prescribed shape and dimensions) gold, precious stones, mineral, coal, and oil claims, and also obtain leases, as detailed below.

AREAS AND WORKING CONDITIONS.

GOLD LEASES—Maximum area, 20 acres; working conditions, one man to every five acres.

MINERAL LEASES—40 acres; one man to every 10 acres.

MISCELLANEOUS LEASES—

Salt	640 acres;	special conditions.
Gypsum	640 "	"
Mining Works	10 "	one man.
COAL OR OIL LEASES	640 "	one man to every 40 acres.
GOLD DREDGING LEASES	200 "	special conditions.
MINERAL CLAIMS	40 "	
GOLD CLAIMS	30ft. x 30ft., alluvial;	100ft. x 600ft., reef.
PRECIOUS STONES CLAIMS	150ft. x 150ft.	

Gold and Precious Stones claims must be constantly worked—one man for each claim—mineral claimholders must employ two men for each claim. Coal or oil claims, eight men. Amalgamation of gold (reef), mineral, coal, or oil claims reduces the labor conditions by one-half until payable results have been obtained.

Gold, mineral, coal, and oil leases are granted for a term not exceeding 21 years—the two former at a rental of 1s. per acre per annum and a royalty of 6d. in the pound on net profits, the latter at a rental of 6d. per acre per annum until coal or oil is found in payable quantities, when 1s. per acre is payable and a royalty of 6d. in the pound on the net profits.

The Minister may permit, for the concentration of labor, of the amalgamation of not more than four adjoining gold or mineral leases.

Any number of gold (reef), mineral, coal, or oil leases may be held by one person.

Licences to search for twelve months for precious stones, mineral phosphates, oil, rare metals, minerals, and earths are issued on specific mineral lands, not exceeding five square miles in area for one person, a fee of 20s. being charged for each square mile or portion thereof. The licences for mineral phosphates, oil and rare metals, minerals and earths give a preferential right to a lease over a portion of the area, as prescribed, and in case of a licence to search for precious stones, to a precious stones claim not exceeding the prescribed area.

MINING ON PRIVATE PROPERTY.

The Mining on Private Property Act of 1909 and the amending Act of 1916 apply only to land, the metals, minerals, precious stones, metalliferous ores, coal, shale, oil, salt, or gypsum on or under which are alienated from the Crown in fee simple.

Prior to 1886 all metals, minerals, &c., were sold with the land (these lands are defined as " Private land " in the Acts), but since 1886 gold, and since 1888 all the metals and minerals in lands sold by the Government are reserved to the Crown and can be dealt with under the Mining Act of 1893.

All arrangements for entry and for mining on private land can be made, if feasible, between the prospector and the owner of the freehold without reference to the Mining on Private Property Acts, *save that a copy of any agreement made must be forwarded without delay to the Mines Office, and six monthly returns giving full details of the mining operations must be furnished.*

The procedure necessary under the Acts is now according to the following summary :—

(1) The prospector will obtain a miner's right.

(2) He will apply for a written authority to enter and peg out from the Minister, or a warden, or mining registrar ; to obtain which it is necessary for him to lodge at the Mines Office a statutory declaration made before a Justice to the effect that there are reasonable grounds, which must be shortly stated, for supposing the land to be mineral bearing ; also a plan showing the land referred to, and a deposit of a sum of money as security against any possible damage done by him during the fourteen (14) days allowed for preliminary prospecting. In connection with the deposit required, the amount should, if possible, be arranged between the applicant and the owner of the land ; but if at the expiration of seven (7) days after an application in this behalf has been made by the applicant to the owner, the amount cannot be agreed upon, the amount of the deposit will be assessed by the department.

(3) On receiving the authority, before actually entering upon the private land, three (3) clear days' notice in writing must be given to the owner and occupier.

(4) The authority entitles the prospector to prospect between the hours of 6 a.m. and 6 p.m. for a period not exceeding fourteen (14) days on an area not exceeding one square mile ; also to make trenches and sink holes, provided that the area of the surface broken by such operations does not exceed 100 square feet. The prospector may also remove samples not exceeding 28lbs. in weight.

(5) If he is satisfied he may peg out the area which he desires to have included in a claim or lease.

(6) The prospector then endeavors to make a private arrangement with the owner of the property for the working of the mineral deposit.

(7) If, after the expiry of one month, he fails to arrive at a satisfactory agreement with the owner, he can apply for a compulsory mining lease.

(8) On the granting of such lease the work of mining or actually raising ore for sale can be commenced.

The right formerly possessed by the owner of the land to work the property himself within a period of two months by complying with the necessary working conditions no longer exists.

NOTES FOR OPAL MINERS.

Every miner must have a miner's right. The fee is 5s. per annum, and they are obtainable at the Adelaide Mines Office, Tarcoola, Port Augusta, Beltana, Hergott (Marree), and Oodnadatta Police Stations, and from Mr. J. W. Duck, Leigh Creek (Copley).

A miner's right may be issued to any " person "—that is, any individual above the age of 16 years. This right forms the basis of all operations under the Mining Acts. Without it a person has no protection, cannot legally prospect or mine, or peg out a claim, and, moreover, is liable to a penalty of £1 per day for unlawfully prospecting and mining.

The holder is authorised to prospect for any metal, mineral, precious stones, coal, or oil, the property of the Crown, with the right of possession when found. It is the authority for pegging out a claim and also to occupy for residence a quarter of an acre of land, from which the holder has the right to remove any buildings erected by him, and he may cut and use timber from Crown lands for his own mining and domestic purposes. Each claim must be represented by a miner's right, and it must be noted that no person can hold more than *one* precious stones claim at the same time.

The area allowed for a precious stones claim is 150ft. by 150ft., and is to be pegged out in the following way :—Four pegs are to be securely placed in the ground to mark the four corners. Each peg must be not less than 3in. thick and project not less than 3ft. above the surface of the ground, and have clearly marked on it the number of the miner's right and the date of pegging. From each peg two trenches must be cut in the ground not less than 3ft. long, 1ft. wide, and 6in. deep, pointing in the directions of the boundary lines of which the peg forms the corner. In rocky ground stone direction piles may be made instead of the trenches. All these marks must be maintained in position while the claim is held, or the claim will be liable to forfeiture. When pegging out ground adjoining another claim a wall 3ft. wide must be left between the claims. The working conditions are one man to be kept constantly employed for each precious stones claim. Constantly employed means eight hours for five working days of the week and four hours for Saturday. Claims can be held for 30 days without registration, and under exceptional circumstances this period may be extended for a further 14 days. The registration must be made at the Adelaide Office, and the form of application is simple and readily obtainable. It must show name and address of applicant, number of miner's right, nature of claim, locality, and sketch showing position. The miner's right must be attached to the application and a fee of 2s. 6d. paid. The certificate of registration is then issued from the Adelaide Office, and the miner's right returned to the applicant with the registered number marked thereon. Care must be taken that the miner's right, by virtue of which the claim is held, is kept valid by renewal at the proper time and not allowed to lapse, otherwise the certificate will become void and the title to the ground lapses.

Every holder of a claim is protected—

(*a*) While he is incapacitated from work by illness ;
(*b*) Absent on urgent business ;
(*c*) In attendance at a court of law ;
(*d*) During the continuance of floods or droughts ;
(*e*) While he is engaged upon work in public or national interest ;
(*f*) During public holidays ; and
(*g*) During 14 days commencing on the 22nd December, and in mines that are over one day's railway journey from Adelaide the Christmas exemption may extend for one month from December 15th, under the Minister's authority.

The onus of proof of good cause for absence lies on the claimholder. Notices should be placed on the claim and also forwarded to the Mines Office, Adelaide.

PREFACE.

THE outstanding features of the mining activity of the State during the period with which this "Review" is concerned have been the prospecting operations in search of brown coal near Moorlands and of silver-lead ore on Baratta Run. Work at both these places is in progress, and the results have been on the whole satisfactory.

All the deposits of brown coal in the State are now in a very different position from that which existed in the past, when imported coal was readily obtainable and cheaply purchased. Increased activity in the exploitation of this fuel is confidently expected, and the State has obtained a modern drill to assist in the work of defining the extent of the lignite beds and the obtaining of samples for analysis.

Quite apart from the problems of mining the lignite, there are the problems of its proper utilisation, to which some reference is made in a report contained in this "Review." The attention of the consumers of fuel is drawn to this aspect, which is quite as important to them as to those who are prospecting the deposits.

L. KEITH WARD,
Director of Mines.

September 21st, 1920.

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DECENNIAL RETURN SHOWING, SO FAR AS CAN BE ASCERTAINED, PRODUCED IN

	1910.		1911.		1912.		1913.		1914.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	ozs.	£	ozs.	£	ozs.	£	ozs.	£	ozs.	£
Gold	6,592	28,000	3,531	15,000	6.592	28,000	6,545	27,800	6,258	26,581
Silver	6,250	625	1,400	140	2,700	326	2,650	300	3,006	314
	Tons						Tons		Tons	
Silver Lead Ore	25	22	—	—	—	—	153	1,100	18	215
	cwts.		cwts.		cwts.		cwts.		cwts.	
Copper	102,040	306,120	118,440	332,500	125,900	461,500	143,222	488,986	137,614	417,487
Lead	400	260	—	—	—	—	—	—	—	—
	Tons		Tons		Tons		Tons		Tons	
Ironstone	46,200	21,945	42,300	26,400	42,200	26,375	60,658	37,911	42,622	37,137
Manganese Ore	—	—	—	—	—	—	—	—	—	—
Molybdenite	—	—	—	—	—	—	—	—	—	—
			cwts.		cwts.		cwts.		cwts.	
Wolfram Ore	—	—	40	154	5	20	2½	10	6	24
Radium and Radio Active Material (Uranium Ore)	—	—	—	—	—	—	—	3,620	—	5,215
Asbestos	—	—	—	—	—	—	—	—	—	—
									Tons	
Alunite	—	—	—	—	—	—	—	—	20	40
							Tons			
Barytes	60	180	—	—	—	—	103	320	560	1,680
			Tons		Tons					
Bluestone	299	5,980	181	4,163	102	2,550	13	325	—	—
Chalk (Talc)	40	100	100	200	120	600	50	250	—	—
Fireclay and Pipeclay	922	188	1,463	169	200	150	320	240	1,223	917
Gypsum	15,800	9,000	9,700	7,275	12,000	9,00	7,150	5,362	16,276	12,207
Kaolin	—	—	—	—	—	—	—	—	10,239	16,382
Limestone	18,600	3,720	28,700	7,175	50,600	12,500	44,300	11,075	54,054	16,892
Magnesite	—	—	—	—	—	—	—	—	—	—
Mica	—	—	—	—	—	—	—	—	—	—
Ochre (crude)	180	746	105	105	300	300	250	250	84	84
Opal	—	—	—	—	—	—	—	—	—	—
Pebbles, Flint	—	—	458	856	120	420	514	1,799	270	829
Phosphate Rock	5,200	5,200	5,800	5,800	6,100	6,100	5,950	6,545	6,083	6,691
Pyrites	2,920	3,270	2,496	2,560	—	—	—	—	—	—
Salt (crude)	54,000	27,000	65,000	40,600	64,300	40,187	65,000	48,750	65,000	48,750
Sulphuric Acid	4,758	3,370	4,626	6,940	5,095	7,642	5,602	7,983	5,940	8,910
Soapstone	90	116	—	—	—	—	—	—	—	—
£	—	415,842	—	450,037	—	595,870	—	642,626	—	600,355

OUTPUT AND VALUE OF THE VARIOUS METALS AND MINERALS SOUTH AUSTRALIA.

1915.		1916.		1917.		1918.		1919.		1910-1919.	
Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Total Output.	Total Value.
ozs.	£	ozs.	£	ozs.	£	ozs.	£	ozs.	£	ozs.	£
6,081	25,830	7,769	33,000	7,141	30,334	6,180	26,252	3,224	13,696	59,913	254,493
2,462	277	3,427	514	1,825	333	1,608	331	561	180	25,889	3,340
Tons 59	625	Tons 243	4,659	Tons 622	12,018	Tons 503	10,161	Tons —	—	Tons 1,623	28,800
cwts. 154,506	561,247	cwts. 145,580	822,527	cwts. 144,262	902,495	cwts. 143,378	828,556	cwts. 50,335	228,930	cwts. 1,265,277	5,350,348
—	—	—	—	—	—	—	—	—	—	Tons 20	260
Tons 237,375	264,612	Tons 188,329	200,382	Tons 328,386	359.723	Tons 257.029	277,279	Tons 268,530	307,402	1,513.629	1,559,166
250	563	544	2,700	264	1,597	1,080	17,876	298	1,490	2,436	24,226
—	—	—	—	cwts. 18½	359	cwts. 4½	98	cwts. 3½	70	T. c. 1 6½	527
cwts. 5	35	cwts. 4	28	4	30	—	—	—	—	3 6½	301
—	—	—	—	—	—	—	686	—	—	—	9,521
7	5	Tons. 21	210	—	—	—	—	—	—	T. c. 21 7	215
—	—	134	670	Tons 29	145	—	—	Tons 60	246	Tons 243	1,101
Tons 290	1,320	456	2,052	790	2,370	Tons 1,352	4,059	1,753	5,264	5,364	17,245
3	69	—	—	—	—	—	—	—	—	598	13,087
—	—	103	309	—	—	235	453	224	785	872	2,697
7,165	5,374	1,605	1,204	1,874	1,405	1,501	710	3,405	1,080	19,678	11,437
19,900	17,413	20,371	17,825	12,776	11,179	32,013	28,012	25,216	18,725	171,202	135,998
1,209	1,934	1,635	2,616	1,967	3,442	2,513	4,888	777	1,463	18,340	30,725
71,723	22,413	74,641	23,325	68,464	21,395	72,209	34,813	45,398	15,994	528,689	169,302
80	160	166	332	150	300	440	666	273	508	1,109	1,966
—	—	—	—	37½	337	—	—	—	—	37½	337
28	28	40	80	78	156	30	60	146	939	1,241	2,748
—	—	—	750	—	500	—	7,175	—	20,000	—	28,425
385	1,023	158	474	1,217	3,956	2,816	11,849	1,243	4,708	7,181	25,914
4,614	5,536	5,013	5,839	5,101	6,064	8,074	10,773	5,950	8,982	57,885	67,530
—	—	—	—	—	—	—	—	—	—	5.416	5,830
64,000	80,000	66,400	83,000	46,858	93,716	88,519	177,038	69,174	138,348	648,251	777,389
5,965	13,421	6,919	10,378	6,190	8,820	6,746	9,613	2,179	3,105	54,020	80,182
—	—	—	—	—	—	75	150	40	80	205	346
—	1,001,885	—	1,212,874	—	1,460,674	—	1,451,498	—	771,995	—	8,603,465

MINING OPERATIONS DURING THE HALF-YEAR ENDING JUNE 30th, 1920.

AREA AT PRESENT HELD UNDER MINING ACTS (JUNE 30TH, 1920).

Nature of Holding.	Number.	Area.
Mineral leases	299	13,745 acres
Gold leases	46	890 "
Miscellaneous leases	105	24,165 "
Coal and oil leases	20	12,800 "
Mineral claims	269	10,580 "
Occupation licences	203	101½ "
Search licences	105	193,920 "
Coal and oil claims	185	118,400 "
Gold claims	3	10 "
Precious stones claims	10	4½ "
Total holdings	1,245	374,616 acres

REGISTERED FROM JANUARY 31ST, 1920, TO JUNE 30TH, 1920.

Miscellaneous leases	11	2,492 acres
Mineral leases	9	340 "
Gold leases	—	—
Mineral claims	101	3,955 "
Coal and oil claims	190	121,600 "
Occupation licences	4	2 "
Search licences	77	157,440 "
Miners' rights	1,250	—
Precious stones claims	4	1¾ "
Coal leases	20	12,800 "
Total	1,666	298,630¾ acres

MEN EMPLOYED.

Estimated number of men employed in mining and mineral works, June 30th, 1920.:—

Copper	1,320
Salt and Gypsum	530
Other minerals	1,000
Smelting works, etc.	875
Total	3,725

GENERAL NOTES.

Reports, as under, will be found :— Page.

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By the Inspector of Mines—
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The Moonta Syndicate's Copper Mine (Wallis and Party) 59
Hicks and Hooper's Copper Mine (Wild Dog) 59

The average price of copper in London during the six months has been—

	£	*s.*	*d.*
Standard	106	0	6
Best selected	115	5	11
Electrolytic	116	12	10

At the Wallaroo and Moonta Mines 44,412 tons of lode material have been broken; 41,535 tons treated, producing 1,247 tons of copper. About 1,300 hands are now employed in the mines and about 320 at the Wallaroo smelters.

Dome Rock Copper Mine, near Boolcoomata.—Water shortage at this place has been a drawback, but 84 tons of 19.85 per cent. ore has been marketed. The work done consists of open cuttings, working out an open cut on an incline, and costeening to prove continuance of lode and determine best places for shafts. The open cut is 35ft. long to a depth of 18ft., and a raised platform 9ft. in length has been erected for receiving trucks from cut to dump, with rails laid on each side, one for mullock and the other for ore.

A certain amount of copper mining has been in progress at the following places:—

North.—Mount Burr (near), Mount Fitton South, Great Gladstone (Willochra), Blinman, Nuccaleena, Barrila, Mandarin, West Burra, Yudnamutana, Kapunda, Diamond Jubilee, Last Chance (near Lyndhurst), Breaden Hill, Belliack.

North-East.—Lovely Gully, Mutooroo.

South.—Kanappa.

Yorke Peninsula.—Hicks and Hooper, Wallis and Party (tributors on Yelta reservation).

All Australian Peace Exhibition.

During the half-year a small collection—from the material available in the Departmental Museum—was shown at the Peace Exhibition. Though small, it was representative of the mineral wealth of the State, and, attracting much attention, has stimulated interest in the useful but less spectacular minerals.

The collection, of about 400 specimens, comprised some 47 metals (ores of) and non-metallic minerals or rocks of economic value, all of which occur and most of which are being produced in the State.

The principal occurrences of each were shown on a locality plan of the State, and showed the relation to the transport facilities, and a brief account of the mode of occurrence, uses, and value of such minerals was shown in juxtaposition to the specimens.

Several plans, illustrative of the geological features of the State and of mineral deposits, and a few photographs typical of the mining industry were shown.

The mineral output of the State from 1840 to 1919 has amounted to £37,597,317, and the growth of the industry and of particular sections was shown by a series of graphs. These show that the total values for 1917 and 1918, each over £1,450,000, easily exceed the production of any preceding year. A small pamphlet on the mineral resources was prepared and issued to those interested.

Deloraine Gold Mines.—Summary of operations for six months ended June 30th, 1920.—Very little work has been done at the main shaft, as the water has been allowed to rise to the 109ft. level. At No. 7 shaft the south drive has advanced 30ft., and a connection made with No. 2 shaft. Total length of drive, 115ft. Reef small and low grade. A winze in south drive has gone down 38ft. in low grade formation; all unpayable. The stopes worked above the 60ft. level proved payable for about 25ft. in height, and afterwards became too small. No. 8 shaft, north end, sunk 72ft. on small reef 8in. to 12in. wide; value 38s. per ton. Surface work on other parts of the lease is in progress.

Owing to a revival of interest in the lignite deposits near *Moorlands*, 190 coal claims have been registered during the half-year. A report by the Government Geologist will be found at page 32.

In view of the vital importance of fuel supplies the Government has purchased a modern drill, and boring operations, designed to prove the extent

and quality of the brown coal deposits of the State, are in progress in the near vicinity of Adelaide. By means of the newly acquired plant the cost of drilling can be materially reduced, and more complete information will be obtained with regard to the seams of fuel penetrated.

The Government has also decided to give effect to the recommendation of the Leigh Creek Coal Committee, and is placing the sum of £5,000 on the Estimates to carry out experimental work on pulverised Leigh Creek coal. The tests will be designed primarily to ascertain the value of this coal for use in railway locomotives; and the tests will be extended to make similar experiments on other domestic fuels, such as the lignite of Moorlands.

Recent discoveries of silver-lead ore have been made at the *Eukaby Field,* near Baratta, where a considerable amount of work was done some 30 years ago. A large number of mineral claims have been registered. The Government Geologist has made an examination, and for his notes on the field *vide* page 43.

Work continues at the *Talisker Mine,* and general preparations are being made for the raising of ore.

Asbestos.—This mineral is at present much inquired after. A recent find near Truro has been reported on by the Deputy Government Geologist —see page 47—and more recently a promising find has been made not far from the old workings in the hundred of Bright, and is now worked by the South Australian Asbestos & Mining Company, Limited. An official report on the property will appear in the next issue.

The Government joined the *Gold Producers' Association,* and has participated in the profits derived from the export of gold. The premium on the gold in ore treated at the Government batteries and cyanide works since the formation of the association has been paid over in full to the producers of the ore, in the hope that prospecting would be stimulated thereby. In some cases the premium so paid has been sufficient to cover the cost of rail freight and battery treatment.

The following proclamation by the Commonwealth Government is re-published for general information:—

[Extract from *Commonwealth of Australia Gazette,* No. 1, dated January 2nd, 1920.]

Prime Minister's Department,
January 2nd, 1920.

REWARD BY THE COMMONWEALTH GOVERNMENT FOR THE DISCOVERY OF PETROLEUM OIL IN COMMERCIAL QUANTITIES IN AUSTRALIA.

A reward of £10,000 will be paid by the Commonwealth Government for the discovery of petroleum oil in commercial quantities in Australia, subject to the following conditions:—

(1) Any person* who is engaged in boring for oil in Australia, and who desires to be considered as a possible claimant for the reward shall—

(*a*) within two months after this date, if he has already begun boring,

*The word "person" includes person, firm, or company.

(*b*) within two weeks from the date of his commencing boring, notify the Minister for Home and Territories in writing at his office in Melbourne. He shall at the same time furnish the following information:—

Precise locality of bore;

If any work done, a full statement relating thereto, including complete and technically correct daily records of strata passed through, sizes of casing and lengths of each size, particulars with regard to the striking of water, fresh, salt, or otherwise, mineralized, hot springs, showings of gas and oil.

(2) He shall, at intervals of not less than one month from the date of above notification, send to the Minister for Home and Territories, and to the Minister for Mines in the State in which he is boring, a full report of all work done on or in connexion with the bore since last report.

(3) The Minister for Home and Territories, and the Minister for Mines for the State, or either of them, may authorise any officer to visit the bore, inspect all operations and records, examine all material extracted from the bore hole, satisfy himself that proper steps are being taken to insure maximum production and to prevent flooding by water of possible oil-bearing strata, examine storage tanks, take test samples at various depths, and make tests with standard apparatus to ascertain the quantity of water present.

Every facility shall be afforded by the claimant and his employees to such officer to make such investigations as he may deem fit.

(4) Should any oil-bearing strata be passed through in the course of boring operations, samples of the oil shall be taken, and not less than 2galls., free from water and other removable impurities, shall be sent to the Minister for Home and Territories and the Minister for Mines in sealed receptacles, with properly authenticated certificates as to the manner in which the oil was obtained.

(5) No payment of the reward shall be authorised unless it is proved to the satisfaction of the Minister that oil to the extent of 50,000galls. has been obtained, and that the bore is still flowing freely and producing oil in commercial quantities.

(6) If any dispute arises—

(*a*) as to who is entitled to the reward; or

(*b*) as to the manner in which the reward is to be distributed in cases where there are more claimants than one; or

(*c*) whether the conditions to be fulfilled in order to entitle the claimant to the reward have been fulfilled; or

(*d*) in any way concerning the claim to be a *bona fide* discoverer of oil in commercial quantities or for reward;

the Minister for Home and Territories may determine the dispute, and his decision shall be final and conclusive.

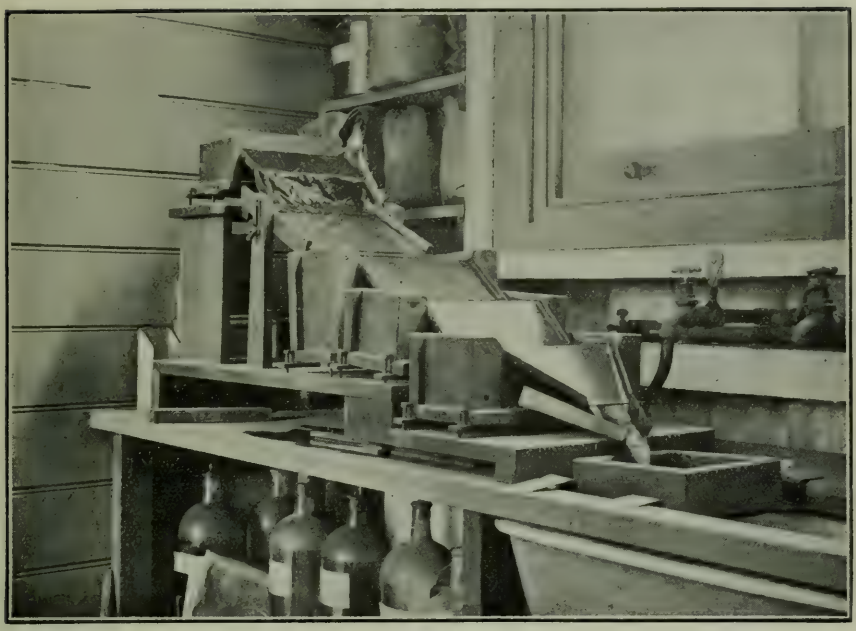
W. M. Hughes, Prime Minister.

Melbourne, September 9th, 1920.

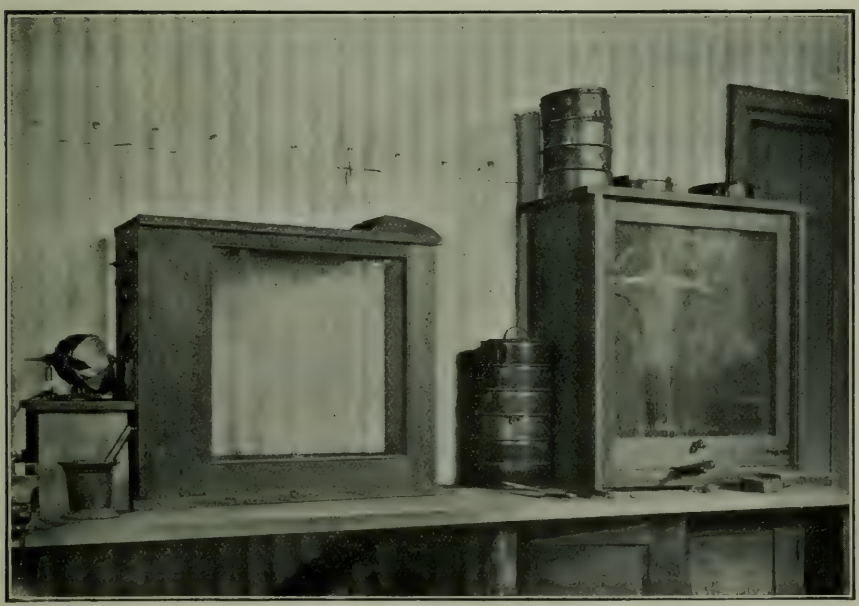
Increase of Reward by Commonwealth Government for the Discovery of Petroleum Oil in Commercial Quantities in Australia.

It is hereby notified for general information that the reward of £10,000 offered by the Commonwealth Government for the discovery of petroleum oil in commercial quantities in Australia, the conditions in regard to which are contained in the *Commonwealth Gazette* of January 2nd, 1920, has been increased to £50,000. W. M. Hughes, Prime Minister.

METALLURGICAL LABORATORY.



Water Flotation Machine for concentration of Graphite, &c.



Pneumatic Separator and Balance.

Face page 14.]

DEPARTMENT OF MINES.

THE NATIVE INDUSTRIES ENCOURAGEMENT ACT, 1872.

NOTICE OF THE OFFER OF A BONUS FOR THE DISCOVERY OF OIL.

Adelaide, April 8th, 1920.

A bonus of £5,000 is offered to the person or body corporate which first obtains from a bore or well situated in the State of South Australia 100,000galls. of crude petroleum, containing not less than 90 per cent. of products obtainable by distillation.

No application for a bonus will be considered unless the following conditions have been strictly complied with :—

1. The applicant for the bonus must have furnished to the Minister of Mines during the progress of drilling operations—

(*a*) A monthly record of work done ;

(*b*) A full log of all bores and wells sunk, whether successful or unsuccessful ;

(*c*) Samples of materials passed through by the bores, to be taken at every 50ft. sunk, and also at every change of country encountered ;

(*d*) A declaration pursuant to " The Statutory Declarations Act, 1835," of the exact locality of each bore or well. (This should be furnished with the first monthly report on the bore or well.)

2. The oil must have been stored at the bore or well from which it has been obtained until the whole 100,000galls. has accumulated.

3. The applicant must furnish with his application—

(*a*) The certificate of a licensed surveyor nominated by the Minister of Mines as to the quantity of oil so stored ;

(*b*) The certificate of the Government Analyst of the result of his analysis of samples of the oil taken by a person nominated by the Minister of Mines ;

(*c*) A declaration pursuant to " The Statutory Declarations Act, 1835," that the whole of the oil for which the bonus is claimed was obtained from the bore or well where it is stored.

4. Within 24 hours of the first discovery of oil in the well or bore, notice of such discovery must be sent to the Minister of Mines.

5. Any person who desires at any time to inspect or test the well or bore on behalf of the Minister of Mines must be granted every facility for this purpose.

6 The applicant must have done nothing contrary to the provisions of " The Mining Act, 1893," or " The Mining Act Amendment Act, 1900," or of any lease or licence granted to the applicant under either of these Acts.

T. PASCOE, Minister of Mines.

DEPARTMENT OF MINES.

THE NATIVE INDUSTRIES ENCOURAGEMENT ACT, 1872.

NOTICE OF THE OFFER OF A BONUS FOR THE PRODUCTION OF GRAPHITE.

Office of the Minister for Mines, Adelaide, June 30th, 1920.

It is hereby notified that, pursuant to the powers conferred by the Act, No. 30 of 1872, and of all other powers in that behalf, a bonus will be paid by the Government on marketable graphite actually mined and prepared for market within the State of South Australia, on the following conditions, namely:—

1. The graphite shall be, in the opinion of an officer (hereinafter referred to as "the supervising officer") appointed by the Minister of Mines to supervise payments of bonuses under this notice, of good marketable quality as graphite.

2. The producer shall give notice in writing to the Department of Mines when he forwards any parcel of graphite on which a bonus is to be claimed, and shall give opportunity and authority for a Government officer to inspect the parcel before it is delivered finally to any manufacturer or consumer of graphite within the State, or is exported from the State. He shall also render an account for the bonus claimed on each parcel on a form provided by the Department, together with account sales showing all particulars and details of the actual sale of the parcel, and a declaration, made pursuant to the Statutory Declarations Act, 1915, that all information given concerning the parcel is true, and that the graphite is the produce of his mine within the State of South Australia.

3. The rate of the bonus will be proportionate to the carbon contents of the graphite. The maximum amount will be one pound (£1) per ton, which will be payable on graphite containing not less than eighty (80) per cent. of carbon. On graphite with a lesser percentage of carbon the bonus will be in proportion to the carbon content.

4. For the purpose of these conditions, the company or person or persons immediately controlling the working of the mine from which the graphite is raised shall be deemed to be the producer of the graphite, and any bonus payable shall be paid to such producer or to an agent authorised in writing by such producer. No bonus shall be payable to any seller intermediate between the producer and the final buyer.

5. The supervising officer, if not satisfied with the accuracy or the sufficiency of the information supplied concerning any parcel, may call for such further information as he may deem necessary, and the information so called for shall be supplied under statutory declaration as above mentioned.

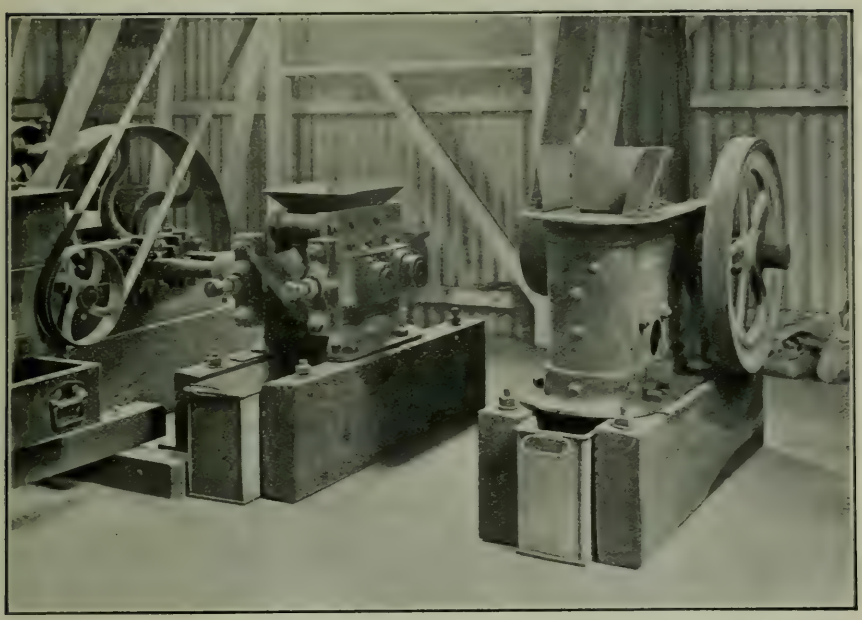
6. The supervising officer's decision as to whether any, and (if any) what amount is payable by way of bonus on any parcel shall be absolutely final and conclusive.

7. The bonuses shall be payable on graphite sold and for which account sales are received by the Department of Mines on or before the 30th day of June, 1922.

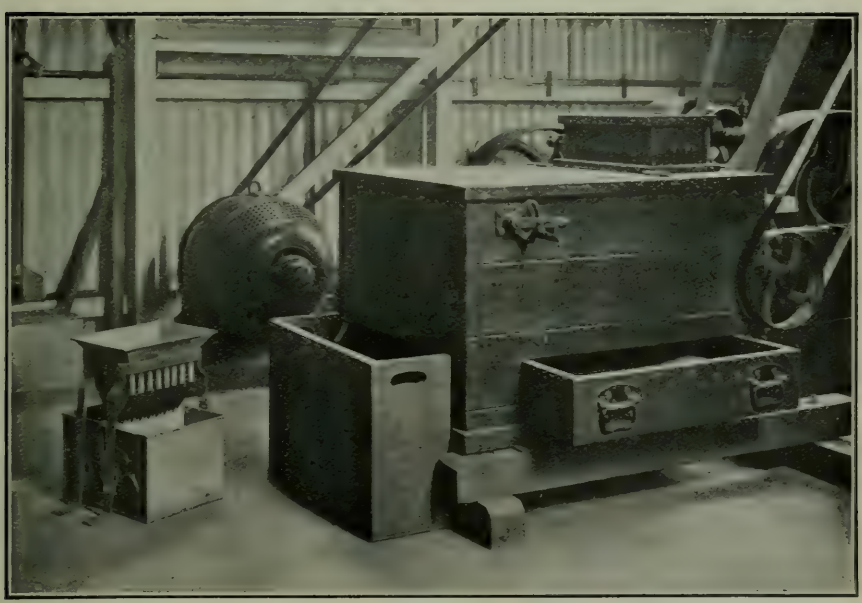
N.B.—This notice supersedes the notice dated April 24th, 1917, contained in the *South Australian Government Gazette* of April 26th, 1917, and the notice dated March 13th, 1919, contained in the *South Australian Government Gazette* of May 8th, 1919, and the notices published in the *Mining Review*, Nos. 26 to 31, inclusive.

Mines Department, 276/1917. T. PASCOE, Minister of Mines.

METALLURGICAL LABORATORY.



Crushing Rolls and Jaw Breaker.



Jones' Sampler and Sturtevant Shaking Sieve.

Face page 16.]

SOUTH AUSTRALIAN ROOFING SLATES.

Offer of Bonuses.

The Government of the State of South Australia have directed that it be made known that it is their intention to offer bonuses to the producer or producers of roofing slates of best approved quality. The slates must be the product of *bona fide* slate quarries situated within the State, and they must be approved by the Superintendent of Public Buildings or an officer nominated by him for the purpose.

This offer is made only in connection with the first 300,000 slates, and is limited to slates produced and approved as before mentioned within the term of two years from October 1st, 1919.

The bonuses offered are as follows:—£3 per thousand for the first 100,000, £2 per thousand for the second 100,000, and £1 per thousand for the third 100,000 of such slates—a possible total of £600.

Bonuses will not necessarily be paid exclusively to any one producer; for example, if of the first 100,000 slates half are produced by one and half by another producer, they will share equally in the first £300.

It is to be distinctly understood that no claim for any bonus will be recognised unless the slate is as good at least in quality as the standard sample now in the possession of the Superintendent of Public Buildings, which may be inspected by arrangement with that officer, nor unless the slate is passed by the Superintendent of Public Buildings for the time being; and that the certificate of that officer and as to what (if any) claims, and which claims (in case of competition) are to be recognised, shall be final; and that he will not consider any claim unless all such facilities as he may require are furnished in order that he may be able to satisfy himself as to the genuineness of the claim and that all conditions have been fulfilled.

If any roofing slates which are inferior in quality to the standard sample above mentioned are dispatched by any producer from his quarry, no bonus will be paid in respect of any part of the load of slates contained in the truck or other vehicle in which such inferior slates are dispatched. If any producer dispatches, whether at the same time or at different times, more than three loads containing inferior slates, as aforesaid, no bonus will be paid to such producer in respect of any of the slates at any time dispatched by him.

William Hague, Commissioner of Public Works.

CRUSHING AND CYANIDING PLANTS.

RETURNS FROM GOVERNMENT CRUSHING AND CYANIDING PLANTS FOR THE HALF-YEAR ENDED JUNE 30TH, 1920.

Name of Mine.	Locality.	Weight of Ore.	Gold Bullion Recovered.	Total Value of Gold Bullion.	Yield per Ton, in Shillings.
		Tons cwts. qrs.	Ozs. dwts. grs.	£ s. d.	s.
MOUNT TORRENS BATTERY AND CYANIDE WORKS.					
Sheoak Ridge	Williamstown	5 0 0	3 11 6	12 16 4	51
Axford	Paracombe District	2 0 0	0 10 20	1 18 0	19
Kluge.....	Lyndoch	6 17 0	0 12 3	2 0 0	5
Emily.	Williamstown	5 17 0	1 19 7	7 4 7	24
Kluge.....	Lyndoch	6 8 0	0 14 3	2 8 0	7
Sheoak Ridge	Williamstown	5 10 0	11 18 21	47 3 6	171
" "	"	5 0 0	2 10 22	9 8 7	37
Total		36 12 0	21 17 10	82 19 0	45
Grand total since starting of battery ..		11,385 2 3	6,851 9 4	25,771 17 11	45
PETERBOROUGH BATTERY AND CYANIDE WORKS.					
Klondyke	Mannahill	6 9 0	8 11 23	31 0 11	96
Homeward Bound ..	"	2 15 0	3 7 18	13 0 5	94
"	"	5 6 0	9 9 18	35 16 4	135
"	"	5 7 0	17 3 3	62 7 1	233
Total.....		19 17 0	38 12 14	142 4 9	143
Grand total since starting of battery ..		5,355 15 0	4,920 7 6	18,299 18 8	68
TARCOOLA BATTERY AND CYANIDE WORKS.					
Royal George	Tarcoola	102 10 0	20 7 12	69 10 7	13
Tarcoola Perseverance	"	25 6 0	15 17 22	56 2 5	44
Gallipoli (New Chum)	"	30 0 0	22 6 0	67 9 2	45
Tarcoola Perseverance	"	25 0 0	4 11 6	12 2 11	9
Wondergraph	"	5 10 0	18 10 14	61 7 3	223
Tarcoola Perseverance	"	62 10 0	15 18 0	56 0 11	18
Total.....		250 16 0	97 11 6	322 13 3	23
Grand total since starting of battery ..		9,016 11 3	11,482 15 16	40,432 2 4	88
GLENLOTH BATTERY AND CYANIDE WORKS.					
New Glenloth Mining Company	Glenloth	42 6 0	26 6 16	81 14 5	38
Grand total since starting of battery ..		3,372 18 0	2,555 13 11	8,564 19 5	50

RETURNS FROM CRUSHING AND CYANIDING PLANTS (OTHER THAN GOVERNMENT) FOR THE HALF-YEAR ENDED JUNE 30TH, 1920.

Name.	Ore Treated.	Gold Bullion Recovered.	Value.	Yield per Ton, in Shillings.
	Tons cwts. qrs.	Ozs. dwts. grs.	£ s. d.	s.
DELORAINE GOLD MINE.				
Deloraine	755 0 0	602 0 0	2,274 6 2	—
*Total	755 0 0	602 0 0	2,274 6 2	60¼

* Also 2 tons 7 cwts. copper, worth £228 17s. 10d., and silver 123½oz., worth £32 14s. 7d.

TOTAL BATTERY AND CYANIDE RETURNS FROM ALL PLANTS FOR SIX MONTHS ENDED JUNE 30TH, 1920.

Name.	Ore Treated.	Gold Bullion Recovered.	Value.	Yield per Ton, in Shillings.
	Tons. cwts. qrs.	Ozs. dwts. grs.	£ s. d.	s.
Mt. Torrens	36 12 0	21 17 10	82 19 0	45
Peterborough	19 17 0	38 12 14	142 4 9	143
Tarcoola	250 16 0	97 11 6	322 13 3	23
Glenloth	42 6 0	26 6 16	81 14 5	38
Deloraine	755 0 0	602 0 0	2,274 6 3	60¼
Total	1,104 11 0	786 7 22	2,903 17 8	52½

SUMMARY SHOWING TOTAL ORE TREATED AT STATE BATTERIES AND CYANIDE WORKS TO JUNE 30TH, 1920, FROM MINES HEREUNDER.

Name of Mine.	Locality.	Weight of Ore.			Gold Bullion Recovered.			Total Value of Bullion.			Yield per Ton, in Shillings.
		Tons.	cwts.	qrs.	Ozs.	dwts.	grs.	£	s.	d.	s.
Associated	Tarcoola	50	13	0	43	6	5	152	18	3	60
Ajax	Waukaringa	125	10	0	89	3	7	347	19	9	55
Angepena Treasure	Mount Serle	4	7	0	17	10	3	69	7	5	318
Axford	Paracombe district	2	0	0	0	10	20	1	18	0	19
Block 245	Wadnaminga	4	16	0	9	16	10	33	18	8	141
Block 249	Wadnaminga	4	13	0	4	15	12	17	8	10	74
Bohun	Tarcoola	93	15	0	27	16	23	99	14	0	21
Barossa Cement	Barossa	98	10	0	28	9	3	114	16	6	23
Banksia	Woodside	219	17	2	180	13	7	698	11	6	63
Blumberg	Birdwood	699	12	0	600	7	22	2,257	8	4	64
Blumberg Proprietary	Birdwood	481	2	0	213	6	4	769	17	4	32
Brind	Woodside	127	16	3	44	18	4	153	0	8	23
Bird-in-Hand	Woodside	154	11	0	48	6	2	248	5	2	32
Boomerang	Outalpa	80	15	0	69	12	16	227	19	6	56
Blunsdens	Peterborough	39	19	0	3	0	19	9	14	0	4
Brilliant	Macaw Creek	9	2	0	8	15	8	29	5	10	64
Crane's Reef	Birdwood	120	12	0	41	2	10	152	7	11	25
Curdnatta	Tarcoola	777	1	0	943	3	6	3,472	4	6	89
Cobra	Birdwood	7	3	0	1	15	4	5	6	0	14
Crown	Birdwood	264	1	3	130	7	22	466	8	0	35
Copperlinka	Olary	165	3	0	111	3	0	419	3	6	50
Day Dawn	Tarcoola	983	13	0	1,546	14	19	5,172	13	7	105
Dark Hill	Near Tarcoola	25	10	0	6	3	17	20	15	9	16
Duchess Neindorf	Tweedvale	52	4	0	54	5	4	198	0	8	75
Deloraine	Kersbrook	482	12	2	569	16	23	2,116	18	8	87
Dart's Syndicate	Mt. Torrens	64	14	0	19	0	0	74	0	0	22
Durdan	Birdwood	217	16	2	83	16	12	316	10	4	29
Diamond Jubilee	Silverton, N.S.W.	12	6	0	4	7	7	13	5	10	21
Dustholes	*Vide* Myrtle		—			—			—		—
Emily	Williamstown	37	16	0	26	4	5	96	8	0	51
Esmonde	Wadnaminga	30	10	0	34	1	11	126	10	1	83
Eureka	Woodside	708	0	3	448	10	2	1,446	11	8	40
Evening Star	Tarcoola	11	2	2	14	5	23	42	19	0	77
Eclipse	Tarcoola	42	4	0	35	8	16	124	10	10	59
Eudunda Hope	Mannahill	32	15	0	7	18	13	30	13	4	18
Federal	Tarcoola	44	3	0	2	6	0	7	1	4	3
Federal	Woodside	41	1	0	20	16	11	81	18	6	39
Flagstaff	Birdwood	10	2	0	3	16	9	14	2	8	28
Fabian's Glenloth	Glenloth	18	10	0	18	18	13	72	17	7	78
Fabian's No. 2	Glenloth	31	13	0	14	5	4	45	12	8	28
Fabian's No. 3 (New Glenloth Gold Mining Syndicate)	Glenloth	1,001	9	0	1,241	17	1	4,178	9	4	83
Great Eastern	Wadnaminga	21	16	0	31	10	21	109	15	5	100
Gallipoli (New Chum)	Tarcoola	170	1	0	214	3	4	723	16	4	85
Government Mine	Tarcoola	445	6	0	1,024	16	22	3,386	1	1	152
Great Talunga (Black Snake)	Birdwood	369	4	3	225	7	15	834	0	1	45
Golden Gate	Angaston	159	4	0	283	9	8	1,185	15	8	149
Gowland's Reef	Mt. Torrens	101	8	3	29	11	4	106	7	3	21
Golden Thorpe	Woodside	205	17	0	86	18	10	342	4	6	33
Golden Junction	Mt. Grainger	226	15	0	151	16	8	578	18	7	51
Glen Markie	Glenloth	369	10	0	202	6	4	712	3	4	38
Great Glenloth	Glenloth	26	10	0	5	19	11	22	16	11	17
Glenloth Pioneer	Glenloth	37	19	2	29	5	9	106	18	8	56
Golden Stream	North-east	10	17	0	6	4	14	21	17	10	40
Glenloth Well	Glenloth	26	0	0	23	11	16	83	19	10	64
Golden Record	Wadnaminga	24	15	0	33	16	17	122	4	9	98

SUMMARY SHOWING TOTAL ORE TREATED, ETC.—*continued.*

Name of Mine.	Locality.	Weight of Ore.			Gold Bullion Recovered.			Total Value of Bullion.			Yield per Ton. in Shillings.
		Tons.	cwts.	qrs.	Ozs.	dwts.	grs.	£	s.	d.	s.
Hennig's	Parnaroo	98	12	0	22	11	10	78	0	3	15
Hall's Reef	Forest Range	50	10	0	68	10	1	247	13	11	98
Haklo	Birdwood	291	12	0	180	3	1	709	8	11	48
Homeward Bound	Mannahill	707	11	0	1,211	4	12	4,750	14	1	134
Hidden Secret	Birdwood	77	4	0	429	19	2	1,654	9	11	430
Hidden Treasure	Tarcoola	52	10	0	36	14	5	117	8	1	45
Ironclad	Mt. Grainger	12	6	0	11	18	9	44	9	5	72
Klondyke	Mannahill	43	0	0	90	12	9	352	4	7	163
Kluge	Lyndoch	6	17	0	0	12	3	2	0	0	5
Kittacoola	Palmer	14	15	0	18	17	8	69	5	11	94
Kirkeek's Treasure	Nillinghoo	485	0	0	780	11	9	2,845	15	0	117
King's Bluff	Olary	127	0	0	250	0	0	750	0	0	118
Lake Labyrinth	25 miles E. of Tarcoola	64	10	0	56	10	11	207	2	3	64
Last Resource	Tarcoola	152	15	0	108	9	20	384	1	9	50
Lease 938	Tarcoola	9	10	0	3	13	18	12	5	4	25
Lease 1022	Tarcoola	12	4	0	8	13	18	23	17	9	39
Lucky Hit	Birdwood	338	16	1	303	6	3	1,148	2	11	67
Little Crumb	Birdwood	77	11	2	136	14	7	516	5	7	133
Lux	Olary	265	8	0	156	4	21	550	17	0	41
Lady Alice	Barossa	24	1	0	49	15	22	195	13	4	162
Lady Edith	Peterborough	10	0	0	1	6	0	4	9	4	9
Lone Hand	Glenloth	446	10	0	522	5	1	1,840	11	11	82
Lake View	Glenloth	18	7	0	25	3	10	88	6	2	96
Last Chance	North-east	11	0	0	2	18	11	11	3	3	20
Morning Star	Tarcoola	307	0	0	555	15	7	1,876	4	10	122
Menzies Barossa	Barossa	23	14	0	15	1	14	52	10	0	44
Mount Torrens	Mt. Torrens	1,252	11	0	652	10	16	2,483	18	5	39
Mount Grainger	Mt. Grainger	690	3	1	725	17	14	2,872	8	6	83
Myrtle (Dustholes)	Mt. Grainger	282	7	1	109	6	23	387	14	5	27
Mount Mitchell	Glenloth	28	9	0	7	6	6	23	5	5	16
Medora	Mt. Grainger	200	0	0	182	6	23	694	9	9	69
Miners Dream	Mt. Grainger	18	13	0	9	3	18	33	11	10	35
Mount Paratoo	Paratoo	50	0	0	5	0	16	15	7	0	6
Mount Lyndhurst	Lyndhurst	1	8	0	0	7	1	1	3	11	16
New Era	Woodside	794	18	0	455	6	13	1,756	6	2	44
New Eclipse or Le Hunte	Woodside	189	5	0	141	13	23	529	16	9	56
New Milo	Wadnaminga	206	5	0	256	4	14	883	12	9	85
Nectar	Mannahill	18	14	0	28	10	23	109	2	2	116
Nil Desperandum	Glenloth	69	0	0	21	13	17	75	3	3	21
Nackra	Nackra	36	18	0	7	2	21	25	5	3	13
Outalpa	Outalpa	90	9	0	53	18	16	184	1	3	40
Perseverance (Gourlay's Claim)	Earea Dam	34	10	0	16	7	11	62	17	7	36
Proprietary	Tarcoola	6	0	0	3	8	8	10	13	6	35
Pioneer	Callington	97	2	0	31	8	20	120	16	9	24
Phoenix	Gawler	11	15	0	6	6	8	21	9	6	36
Royal Charlie	Mannahill	20	7	0	5	10	5	15	19	1	15
Royal George	3 m.W. Tarcoola	1,129	17	0	596	15	5	2,171	15	10	38
Railway	West Australia	14	2	3	15	0	23	51	16	2	73
Royal Tiger	Glenloth	53	5	0	32	5	15	115	4	10	43
Ruby	Barossa	16	2	0	23	7	23	88	13	4	110
Reddaway's	Mt. Torrens	150	2	1	40	2	9	131	3	4	17
Scotchman	Teetulpa	14	17	0	9	18	20	34	4	8	46
Schuppan (Kluge)	Lyndoch	14	8	0	2	19	7	10	11	2	14
Section 121	Hd. of Talunga	3	15	0	2	2	9	7	15	6	41
Spanish American	Mannahill	21	3	2	10	12	11	39	6	3	37
Shamrock	Tarcoola	48	0	0	77	13	23	303	1	9	126
Sheoak Ridge	Williamstown	15	10	0	18	1	1	69	8	5	89
Sims Section	Mt. Torrens	73	18	0	13	0	0	46	11	11	12

SUMMARY SHOWING TOTAL ORE TREATED, ETC.—*continued.*

Name of Mine.	Locality.	Weight of Ore.			Gold Bullion Recovered.			Total Value of Bullion.			Yield per Ton, in Shillings.
		Tons.	cwts.	qrs.	Ozs	dwts.	grs.	£	*s.*	*d.*	*s.*
Schubert's Reef	Mt. Torrens ...	95	18	0	54	5	2	187	15	4	39
South Knappa	Woodside	7	13	0	3	7	11	13	2	6	34
Stars and Stripes	Mt. Grainger ..	20	3	0	5	18	10	22	17	7	22
Triumph	Wadnaminga .	17	18	0	8	11	17	32	4	3	35
Tarcoola Blocks	Tarcoola	650	3	0	950	12	8	2,917	8	9	82
Tarcoola Blocks, Enterprise Lease	Tarcoola	402	11	1	484	10	20	1,661	19	5	89
Tarcoola United	Tarcoola	56	10	0	100	0	15	331	4	3	117
The Gem	Tarcoola	42	12	0	90	6	19	277	16	11	130
Tarcoola West	Tarcoola	53	5	0	63	14	4	253	5	11	95
Tarcoola Perseverance	Tarcoola	2,163	0	3	3,462	1	0	12,879	17	0	119
Tolmer's Hill.....	Tarcoola	6	0	0	1	11	16	5	8	0	18
Union Jack	Waukaringa ..	17	2	0	2	16	13	9	18	9	11
Ulooloo	Ulooloo	28	5	0	13	5	11	52	19	0	37
Vienna (Descovitch's Reef)	Mt. Pleasant ..	29	3	0	14	0	3	47	15	7	32
Virginia	Wadnaminga .	13	1	0	18	10	14	68	6	1	104
Warrigal South	Tarcoola	73	12	3	107	2	12	341	1	6	92
Wondergraph	Tarcoola	35	15	0	75	10	18	261	11	9	146
Warrigal	Tarcoola	118	17	0	134	16	4	347	18	5	58
Wilgena Syndicate ..	Tarcoola	29	15	0	23	15	12	88	10	7	59
Wilgena Enterprise ..	Earea Dam....	348	8	0	323	7	22	1,279	8	2	73
Wilgena Associated ..	Tarcoola	45	0	0	98	10	10	364	3	11	161
Wheal Ellen	Strathalbyn ...	68	0	0	18	9	5	62	8	11	18
Welsh Prince.....	Wadnaminga ..	10	0	0	3	10	13	12	8	0	25

COPPER.

AVERAGE MONTHLY PRICE OF COPPER, JANUARY TO JUNE, 1920.

	Standard.			Best Selected.			Electrolytic.		
	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
January.....	118	4	1	123	5	7	123	18	10
February	120	6	2	126	16	3	128	10	6
March	109	11	11	118	5	7	119	14	4
April	103	2	11	111	18	11	112	15	0
May	96	18	1	109	5	0	110	7	0
June	88	0	0	102	4	5	104	11	4
Average.....	106	0	6	115	5	11	116	12	10

AVERAGE PRICE OF STANDARD COPPER FOR THE LAST TEN YEARS.

	£	*s.*	*d.*		£	*s.*	*d.*
1910	57	3	3	1915	72	12	9
1911	56	1	10	1916	116	1	3
1912	73	1	3	1917	125	2	4
1913	68	5	8	1918	115	11	6
1914	60	8	1†	1919	90	19	3

Average for the 10 years, £83 10s. 8d.

† Quotations for nine months only.

GOVERNMENT DRILLING OPERATIONS.

REPORT BY THE SUPERVISOR OF BORING OPERATIONS.

During the half-year ended June 30th, 1920, the No. 1 diamond drilling plant was employed at Moonta and near Cunliffe.

This drill, in charge of Mr. A. W. Matthews, Engineer for Boring, was engaged on Nos. 22, 23, and 24 boreholes of the Yelta Series, testing the extension of the Wild Dog or Eastern Lode in tribute blocks Nos. 2 and 3.

No. 22 *bore,* situated midway between Nos. 10 and 21, was sunk at an angle of 60° from the horizontal to a total depth of 322ft., in felspar porphyry. It cut a small seam showing chalcopyrite and pyrite at 125ft.; at 200ft. to 201ft., 1ft. of felspar porphyry with small quartz veins; and at 215ft. to 216ft., felspar porphyry showing small quartz veins, schorl, and a little pyrite.

No. 23 *bore,* situated 190ft. S. 40° E. from No. 9 bore, was sunk at 60° from the horizontal to a total depth of 180ft. in felspar porphyry. Between 119ft. 6in. and 122ft. 6in. lode material, consisting of felspar porphyry with small quartz veins and a little pyrite and chalcopyrite, was cut. Similar material, with a little schorl, was passed through between 145ft. and 147ft. 4in. Both lode formations were too poor for assay.

No 24 *bore,* situated 250ft. N. 43° W. from No. 18 bore, and pointing towards No. 18, was sunk on an angle of 60° from the horizontal. This bore penetrated 420ft. of felspar porphyry in which barren quartz veins were cut at 57ft. to 58½ft., at 68ft. to 68½ft., and at 284ft. to 285ft. On completion of this hole the drill was removed to the Cunliffe Copper Mine to test below the shallow surface workings.

No. 1 *bore, Cunliffe,* situated on section 505, hundred of Kadina, 165ft. N. 46° W. from the main shaft, had reached a depth of 235ft. on June 30th. The bore was inclined 60° from the horizontal. The bore passed through horizontally bedded Cambrian limestone for the whole distance. Between 175ft. and 235ft. disseminated specks of pyrite and chalcopyrite were visible in the core.

The calyx drill, in charge of Mr. C. F. Duffield, was dismantled and returned from Leigh Creek coalfield to the Engineer-in-Chief's Department store. The No. 2 diamond drill plant was set to work on the Wheal Ellen to prove the lode below the old workings of this formerly important mine.

No. 1 *bore, Wheal Ellen,* situated 390ft. E. 16° S. of the north shaft, and laid out at 67° dip to cut the lode below the bottom of this shaft. The bore penetrated 500ft. of mica schist. Quartz seams were cut at 51ft. to 52ft.; 111ft. to 111ft. 3in.; 127ft. 6in. to 128ft.; 230ft. to 230ft. 1in., with ironstone; 257ft. 6in. to 258ft.; 308ft. to 308ft. 3in.; 356ft. 6in. to 356ft. 10in.; 361ft. to 361ft. 2in.; and 412ft. 6in. to 412ft. 8in.

The Wheal Ellen lode was cut at 350ft. 6in. to 354ft., and consisted of heavily mineralised stone containing:—

	Gold. per ton. dwt.	Silver. per ton. dwt.	Copper. %	Lead. %	Zinc. %	Sulphur. %
Sludge..	1	8	1.5	.8	2.2	47.3
Core	trace	24	.9	2.3	4.8	38.3

Between 478ft. 5in. to 479ft. quartz was cut containing a little pyrite, but no gold, silver, or copper.

No. 2 bore, Wheal Ellen, situated 570 ft. E. 17° S. of the south or engine-house shaft; this bore was laid out at a depressed angle of 67° to cut the lode below the shaft.

It was drilled for 642ft. through mica schist and quartz mica schist. Quartz seams were cut at 90ft. to 90ft. 5in.; 114ft. to 114ft. 6in.; 141ft. to 141ft. 4in.; 300ft. to 300ft. 1in.; 410ft. to 410ft. 1½in.; 428ft. to 428ft. 2in.; 437ft. to 437ft. 1in.; 481ft. to 481ft. 2in.; 490ft. to 490ft. 1in.; 505ft. to 505ft. 1in.; and at 621ft. 6in. to 621ft. 8in. pyritic lode material was cut.

After the completion of the boring at Wheal Ellen, the staff of the No. 2 drill received the new coal-boring plant, and were engaged in assembling it.

This plant, purchased by the Government for testing shallow deposits for coal, consists of a modern percussive and rotative drill and oil engine. Its weight is much less than that of the steam-driven calyx formerly in use, and the drill can be shifted from the site of one shallow hole to the next with much less delay than the more cumbersome plant, and obtains a more complete core sample.

At present (September) it is engaged in boring in the Hope Valley district to test the tertiary lignite deposits that exist there (1).

(1) *Vide* Reviews of Mining Operations, Nos. 14 and 20 (pp. 19 and 40).

SUBSIDIES.

The Legislature provided in the Mining Act, 1893, and in previous measures for the encouragement of mining.

The following schedule shows what subsidies have been paid from the inception of the system to June 30th, 1920, and the sums repaid. In the ordinary way these repayments are made from profits—50 per cent. of such profits being devoted to repayments. In two instances only have the profits won enabled full repayments to be accomplished—the Crystal Mine, at Echunga, which repaid £76 7s.6d. from that source, and the once-famous New Alma and Victoria Mine, Waukaringa, which repaid in full the first subsidy, £3,000. The repayment of £2,100 by the Hamley Company was made on the sale of the property to the Wallaroo and Moonta Co. The remainder of the recoveries was derived from sales of mining plant held as security. The total of the subsidies advanced is £65,108 16s. 1d., of which £11,264 5s. 4d. have been recovered, and £2,250 written off, leaving a debit balance of £51,594 10s. 9d. Portion of this outstanding debt is represented by machinery that has fallen into the hands of the Government; add to this the value of the metals won, and the State in general will probably have benefited beyond the money value of the debit balance.

STATEMENT OF SUBSIDIES PAID FROM COMMENCEMENT TO JUNE 30TH, 1920.

Name of Company or Person to whom Subsidy Granted.	Locality.	Amount Advanced.	Amount Repaid.
		£ s. d.	£ s. d.
Adelaide Crushing, Grinding, and Amalgamating Mill Co.	—	100 0 0	—
Algebuckina Gold Mining Syndicate	Algebuckina	52 10 11	52 10 11
Alma Extended Gold Mining Co.	Waukaringa	3,000 0 0	276 16 0
Backhouse, T. S.	Worturpa	100 0 0	—
Barossa Enterprise Gold Mining Coy.	Barossa, Hundred of	232 2 6	—
Belalie Copper Mining Syndicate	Bundaleer	392 12 3	5 0 0
Beltana Rapid Ore Treatment Syndicate	Near Beltana	596 8 4	—
Bevilaqua & Angel	Palmer (near)	57 18 0	—
Bird-in-Hand Gold Mining Co., Ltd.	Woodside	3,000 0 0	—
Blackfellow's Creek Gold Mining Co., Ltd.	Kuitpo, Hundred of	660 6 7	35 0 0
Callington Copper Mining Co.	Callington	148 8 7	17 0 0
Cockburn Copper Mining Co., N.L.	Mutooroo	273 18 5	173 13 8
Commonwealth Silver-lead Co., Ltd. (Wheal Ellen Mine)	Strathalbyn, Hund. of	750 0 0	440 3 3
Copper Hill Mining Co., N.L.	Kadina	391 15 0	115 0 0
Cornwall Copper Mining Syndicate, N.L.	Kadina, Hundred of	500 0 0	—
Countess of Jersey Gold Mining Co., N.L.	Wadnaminga	321 0 0	—
Cowell Consolidated Silver and Copper Mines	Hds. Miltalie & Hawker	406 9 8	25 0 0
Currency Creek Copper Mining Co.	Currency Creek	28 6 5	20 0 3
Crystal Gold Mining Co.	Echunga	563 17 6	176 7 6
Davis, A. (Dorris Fabian Mine)	Leigh's Creek, Near	357 0 0	—
Ding Dong Copper Mining Syndicate	Kanmantoo, Hund. of	124 0 4	—
Duke of Cornwall Gold Mining Syndicate	Mount Pleasant	458 17 4	43 10 0
Eagle Silver Mining Co, Ltd.	Glen Osmond	500 0 0	—
Ediacara Consols Silver Mining Co., N.L.	Ediacara	651 12 1	465 17 0
Enterprise Copper Mining Co., N.L.	Barossa, Hundred of	150 0 0	9 16 0
Enterprise Excelsior (Barossa Amalgamated)	"	2,000 0 0	—
Eureka Gold Mining Co., Ltd.	Woodside	1,500 0 0	—
Eureka Gold Mining Syndicate	"	340 17 11	6 10 0
Fels, J. A. R. (Nichol's Nob Mine)	Leigh's Creek, Near	150 0 0	—
Fifth Creek Central Silver and Copper Mining Co., N.L.	Fifth Creek	253 2 4	—
Fortress Hill Mining Syndicate	Fortress Hill	60 0 0	—
Foster, A. E. J. (David Copperfield Mine)	Hundred Onkaparinga	19 5 0	—
Glenloth Mining, Battery, & Options Co., N.L.	Glenloth	515 4 7	515 4 7
Glenloth Wells Pioneer Blocks Co., Ltd.	"	100 0 0	22 18 5
Great Eastern Gold Syndicate, N.L.	Wadnaminga	300 0 0	300 0 0

STATEMENT OF SUBSIDIES PAID—*continued.*

Name of Company or Person to whom Subsidy Granted.	Locality.	Amount Advanced.			Amount Repaid.		
		£	s.	d.	£	s.	d.
Gumeracha Gold Mining Syndicate	Gumeracha	75	0	0	—		
Golden Junction Gold Mining Co, N.L.	Hundred of Coglin	231	10	0	—		
Golden Point Claims	Wonna	50	0	0	—		
Great Ironclad Gold Mining Co.	Teetulpa	218	6	9	—		
Hakendorf, C. H., and Williams, J. (Glenmarkie Mine)	Glenloth	221	17	6	12	0	0
Hamley Copper Mining Co.	Wallaroo	2,100	0	0	2,100	0	0
Homeward Bound and Klondyke Gold Mines, N.L.	Mannahill	192	17	1	83	18	6
Heithersay, J. (Kirkeeks Treasure Mine)	Waukaringa	819	8	0	3	19	9
Hunter Bros. (Lady Millicent and Nuccaleena Mines)	Mochatoona	699	19	10	12	0	0
Ireby Gold Mining Syndicate	Mount Grainger	35	4	3	—		
Kanappa Copper Mining Co.	Hundred Angas	146	19	11	1	5	0
Kanmantoo Copper Mines Syndicate, N.L.	Kanmantoo	150	2	1	—		
Kingsborough, W. A. (Benowrie Mine)	Near Cutana	31	18	6	—		
Kirkeek's Treasure Gold Mining Co.	Waukaringa	691	8	1	—		
King's Bluff G.M. Co., N.L.	Olary	622	0	8	—		
Kohinoor Gold Mining Co., N.L.	Kangaroo Island	100	0	0	—		
Kohinoor Mine (H. G. Taylor)	"	200	0	0	—		
Lady Alice Gold Mining Co.	Barossa, Hundred of	1,797	2	3	—		
Lady Franklin Syndicate	Port Lincoln	200	0	0	40	0	0
Leigh's Creek South Coal Mining Co., N.L.	Leigh's Creek	95	16	4	95	16	4
McMurtie's Claims	Kuitpo, Hundred of	199	19	11	—		
Mingary Gold Mining Co.	New Luxemburg	400	0	0	—		
Montacute Gold and Copper Mining Co., N.L.	Sixth Creek	400	0	0	—		
Mount Victoria Mine	Bimbowrie	50	0	0	—		
Mount Malvern Silver Mining Co.	Blackwood	491	3	6	—		
Mount Malvern Silver-lead Mining Co., N.L.	Clarendon	1,539	6	4	—		
Mount Pangæus Gold Mining Co.	Hahndorf (near)	56	1	4	—		
Mount Monster Gold Mining Syndicate	Kuitpo, Hundred of	350	0	0	1	0	0
Mt. Grainger Ironclad Gold Mining Syn., Ltd.	Mount Grainger	21	18	10	—		
Mount Torrens Gold Mining Co.	Mount Torrens	1,000	0	0	—		
Mount Remarkable Mining Co., Ltd.	Wongyarra, Hund. of	122	8	1	15	0	0
Musgrave Ranges Prospecting Association	Musgrave Ranges	47	2	0	—		
Mount Painter Corundum and Gem Syndicate	Mount Painter	47	3	1	—		
Morning Star Gold Mining Co.	Teetulpa	68	4	6	—		
Mutooroo Copper and Silver Mining Co., Ltd.	Mutooroo	500	0	0	500	0	0
Myrtle Gold Mines, N.L. (Dustholes)	Hd. Coglin	370	1	4	25	0	0
Nackara Proprietary Copper Mining Co., N.L.	Nackara	100	0	0	—		
Nackara Proprietary Gold Mining Syndicate.	Nackara	100	0	0	—		
New Banksia Gold Mining Syndicate	Nairne	250	0	0	—		
New Alma and Victoria Gold Mining Co., Ld.	Waukaringa	3,000	0	0	3,000	0	0
New Ajax Consolidated Gold Mining Co., N.L.	"	750	0	0	—		
New Era Gold Mining Co., Ltd.	Woodside	1,000	0	0	—		
New Glenloth Battery and Mining Co., N.L.	Glenloth	750	0	0	—		
New Medora and Grainger Gold Mines Syn., N.L.	Mount Grainger	1,421	9	9	—		
New Mingary Gold Mining Co.	New Luxemburg	250	0	0	—		
New Mount Grainger Gold Mines, N.L.	Mount Grainger	393	7	1	220	0	0
Northern Mining and Smelting Co., N.L.	Mount Rose	350	0	0	11	5	0
North Nairne Gold Mining Co.	Nairne	500	0	0	—		
North-West and West Australian Pros. Co.	North-west of S.A.	104	9	7	—		
North-West Prospecting Association, N.L.	Tarcoola	150	0	0	—		
Nil Desperandum Teetulpa Devt. Co., N.L.	Teetulpa	64	14	4	20	5	6
Nilpena Copper Mining Co., Ltd.	Blinman	290	5	3	—		
Olivaster Silver-Lead Mining Co., N.L.	Hundred Yankalilla	300	0	0	—		
Onkaparinga Dredging and Mining Co., and Echunga Propy. Hydraulic Gold Sluicing Co.	Biggs' Flat	1,050	0	0	700	0	0
Paull's Consolidated Copper Propy., N.L.	Burr Well	525	0	0	17	13	0
Parara Mining Co., N.L.	Maitland	571	3	6	—		
Paringa Mining Syndicate	Callington	399	16	8	244	0	0

STATEMENT OF SUBSIDIES PAID—*continued.*

Name of Company or Person to whom Subsidy Granted.	Locality.	Amount Advanced.			Amount Repaid.		
		£	s.	d.	£	s.	d.
Paringa and West Kanmantoo Consolidated Copper Mine, N.L.	Callington	1,144	3	4	210	5	0
Pioneer Gold and Copper Mining Syndicate	"	95	15	6	66	19	6
Polmear, W. J. L. (Poona Mine)	Moonta	800	0	0	31	0	0
Poonana Silver, Lead, & Copper Mining Syn.	Hundred Mann	137	7	10	—		
Port Lincoln Copper Co., Ltd.	Reedy Creek	800	0	0	—		
Prince Albert Mining Syndicate	Hundred Onkaparinga.	214	0	0	2	0	0
Queen Bee Mining Co., N.L.	New Luxemberg	250	0	0	250	0	0
Quorn Manganese and Silver Mining Co.	Quorn	10	9	10	—		
Rapid Bay Silver Mining Co., N.L.	Yankalilla, Hund. of	136	2	4	—		
Robertstown Bright Silver Lead Mines	Hd. Bright	170	5	11	—		
Royal Charlie Gold Mining Co.	Mannahill	153	18	5	—		
Rees, R. (Ajax Mine)	Waukaringa	604	14	5	—		
Saunders, L. E. (Great Eastern Mine)	Wadnaminga	98	10	0	98	10	0
Sixth Creek Gold & Copper Mining Co., L.N.	Sixth Creek	161	1	11	—		
Stainbank, A. T.	Fifth Creek	70	14	11	—		
Sliding Rock Copper Proprietary, N.L.	Sliding Rock	2,000	0	0	32	11	0
Tarcoola Blocks Gold Mining Co., Ltd.	Tarcoola	4,345	5	2	214	10	5
Tarcoola Enterprise Gold Mining Co., N.L.	"	100	0	0	19	10	4
Tarcoola Proprietary Gold Mines, N.L.	Tarcoola	150	4	4	9	15	0
Teatree Gully Gold Mining and Pros. Assn.	Teatree Gully	234	5	7	—		
Teetulpa Mining and Crushing Co.	Teetulpa	349	11	4	—		
Teetulpa Prospecting Syndicate	"	49	15	6	—		
Trewartha S.H. (Royal George Mine)	Tarcoola	10	0	0	—		
Tumby Bay Copper Mining Co., N.L.	Hutchison, Hund. of	800	0	0	—		
Uley Graphite Syndicate	Uley, Hundred of	210	15	0	—		
Utica Copper Mining Co. N.L.	Burra	224	16	7	109	18	6
Victoria Hill Amalgamated Gold Mining Syn.	Barossa, Hundred of	38	12	6	—		
Victoria Tower Mining Co., N.L.	Mannahill	345	18	9	90	0	0
Walton Hill Copper Mining Syndicate	Near Freeling	50	0	0	1	10	0
Warrakimbo Propy. Copper Mining Synd.	Barndioota, Hundred of	220	16	2	—		
Warra Warra Propy. Copper Mines, N.L.	Farina	322	4	11	322	4	11
Watt's Gully Gold Mining Co.	Gumeracha	50	0	0	—		
Watt's Gully Reef Claims	Gumeracha	50	0	0	—		
Wolters, F. C., & Co	Echunga	25	0	0	—		
Wallaroo Central Mining Co., N.L.	Kadina	500	0	0	—		
Westward Ho Mine (Dr. H. Dixon)	Mannahill	1,000	0	0	—		
Wohler, H., & Co.	Myponga	20	0	0	—		
Wheal Turner Copper Mining Co., Ltd.	Prospecting on proposed line to Queensl'd Border	1,000	0	0	—		
Winninninnie Gold & Silver Propy. Co., N.L.	Winninninnie	86	3	6	—		
Woodside Boring and Mining Syndicate	Woodside	422	17	11	—		
Worturpa Exploration and Mining Co., Ltd.	Worturpa	800	0	0	—		
Yelta New Copper Mining Co., N.L.	Wallaroo	1,000	0	0	—		
Young Bullfinch Gold Mining Co., N.L.	Talunga, Hundred of	146	3	4	2	0	0
Totals	—	65,108	16	1	11,264	5	4

NOTES ON THE SAMPLING AND VALUATION OF PROSPECTS.

The Department of Mines, Flinders Street, Adelaide, frequently receives for assay and advice, parcels of various minerals and ores. Such a parcel may have one or more of the following faults:—

(1) It may contain a single piece, obviously picked.

(2) The quantity forwarded may be of insufficient size either for assay purposes or to properly represent the material sampled.

(3) The parcel may be unaccompanied by any statement or request showing the information desired.

(4) It may carry no marks to identify it with the letter of advice.

(5) There may be no letter of advice.

(6) There may be no declaration of the exact locality, without which free assays cannot be made.

(7) The letter of advice may contain no information as to the width or size of the body from which the material has been taken—information which may be necessary before it is possible to advise as to the value of a deposit.

THE MEANING OF THE WORD "SAMPLE."

A specimen is not a sample. A specimen shows the nature of a rock or ore; a sample is intended to show its value, and must be representative of a pile of ore or of a lode at a definite place.

A "representative" sample is a small proportion of the original bulk, containing, in unchanged percentages, all the constituents of the original lot. Such a sample gives the value of a pile of ore. The average of a number of samples, broken from the workings of a mine, represents very closely the value of the material sampled. Both broken ore and mines are, in many cases, sold on the values arrived at by sampling.

HOW TO TAKE A SAMPLE.

In sampling a lode, samples should be taken at definite intervals, and the lode should be sampled over measured widths at these localities. Widths should be measured at right angles to the lode, that is, along the shortest line between the walls.

A sample must be taken by breaking the same bulk for each foot of width. This should be done as evenly as possible over the whole width that the sample is intended to represent, and all the material that would be subsequently milled or smelted, whether rich or poor, should be included in the sample. The quantity taken might amount to one pound per foot of lode width; but the nature of the ore body and the distribution of the values (whether uniform or irregular) must be considered when deciding on the size of the sample. With uniform values the interval along the lode can be greater and the amount broken less than if the lode carries irregular values, as in the case of a lode carrying coarse gold.

THE PROPER WAY TO REDUCE THE SIZE OF A SAMPLE.

Such a sample, if of any considerable size, should then be broken into smaller pieces, well mixed, and quartered down. Quartering down means that the broken ore, after mixing, is piled into a cone on a floor or cloth, and that the cone is flattened and subdivided into four parts by two cuts at right angles. If the ore is sufficiently broken and mixed the sample obtained by taking the two opposite quarters, A A, has a value equal to the rejections B B, shown in the following diagram:—

HOW A SAMPLE SHOULD BE QUARTERED.

At each quartering care should be taken to sweep all rejections away.

By successive finer crushing and quartering, a sample, of 1lb. to 2lbs. is obtained that has the same value as the bulk first broken from the lode. This sample of 1lb. to 2lbs. should then be properly bagged, marked, and sent for assay. It would be well to enclose a specimen of 1oz. to 2ozs. of the uncrushed ore for inspection.

In reducing the large sample first obtained it is essential that the lumps of ore be broken smaller by at least half between each quartering. For example, a sample averaging, as broken, 1in. pieces, might be broken to $\frac{1}{2}$in., $\frac{1}{4}$in., and $\frac{1}{8}$in. particles before each successive quartering, to ensure uniform mixing and the even distribution of the valuable material.

THE USE OF ASSAY RESULTS.

Individual samples of standing ore may differ from the true value of the lode, but the average of a number of such samples will be very nearly that of the body of stone which they represent. Thus it will be seen that, in estimating the value of standing ore, reliance is to be placed, not on a single sample, but on the average value of a number of samples.

THE VALUATION OF BROKEN ORE.

Sampling a pile of broken ore may be done either by quartering, or by taking every second, tenth, or any other proportion of shovelfuls when shovelling the pile over, the proportion depending upon the way in which the values are distributed through the ore.

In sinking or driving on a lode, the value of the ore broken can be determined by making a separate pile with every fifth or tenth bucket of ore raised, and cutting down the small pile so made by shovelling and quartering. This procedure, if adopted, would in many cases prevent undue disappointment or the incurring of a loss through sending unpayable material to be treated.

ESTIMATION OF GOLD CONTENTS BY PANNING.

In estimating gold contents by panning during prospecting work, representative samples of constant weight or bulk should be taken. Too often a selected lump of kindly appearance is crushed, with the result that the value of the ore is over-estimated, and disappointment results when a parcel is sent to a battery. A record kept of all panning results, and the position and width of lode over which a sample is taken, will do much towards facilitating the opening up of a mineral property.

SUGGESTIONS FOR TAKING AND FORWARDING SAMPLES.

It is suggested that the following precautions be taken in sending samples for assay:—

(1) Each sample should be taken so as to be representative of the material sampled.

(2) Each sample should be properly marked so that it can be identified by the Department and by the sender.

(3) A letter of advice referring to these marks should be sent containing particulars as to—

(*a*) The exact location of the material sampled relatively to some well-known point.

(*b*) The width over which the sample has been taken.

(*c*) The depth at which it was taken.

(*d*) What valuable constituent is supposed to be present.

The Department reserves the right to refuse to make any particular assay of samples of insufficient promise or which do not conform to the conditions enumerated above.

No assays will be made of metallurgical products, and no umpire samples or materials showing free gold will be tested.

ACCIDENTS IN MINES AND QUARRIES.

A gratifying feature of our mining operations in mines and quarries is the infrequency of serious accidents. Act No. 858 of 1904, bringing quarries in the same category as mines as regards the control of the Department of Mines has been effective in safeguarding the interests of quarry-men. The following table gives the number of accidents in mines and quarries during the last ten years:—

ACCIDENTS IN MINES AND QUARRIES.

Accidents in Mines.				Accidents in Quarries.			
Year.	Total Number of Accidents Reported.	Number of Persons Injured.	Number of Persons Killed.	Year.	Total Number of Accidents Reported.	Number of Persons Injured.	Number of Persons Killed.
1910	6	3	3	1910	2	1	1
1911	2	—	2	1911	—	—	—
1912	3	2	1	1912	2	—	2
1913	10	8	2	1913	—	—	—
1914	3	2	1	1914	3	2	1
1915	3	—	3	1915	3	2	1
1916	5	1	4	1916	—	—	—
1917	8	6	2	1917	2	2	—
1918	7	5	2	1918	2	2	—
1919	—	—	—	1919	3	2	1

ASSAYS AT SCHOOL OF MINES.

NUMBER OF ASSAYS MADE FOR PUBLIC PURPOSES AT THE SCHOOL OF MINES ASSAY DEPARTMENT DURING THE SIX MONTHS ENDED JUNE 30TH, 1920.

	1920.					
	January.	February.	March.	April.	May.	June.
Department of Mines	27	12	70	35	55	22
Public assays	52	96	60	134	66	91
Totals.....	79	108	130	169	121	113

REPORTS FORMING ADDENDA TO THE RECORD OF MINES.

REPORTS

BY

The Government Geologist (L. Keith Ward, B.A., B.E.).

REPORT ON THE DEPOSIT OF LIGNITE NEAR MOORLANDS.

The extensive prospecting operations now being carried out in the neighborhood of Moorlands are concerned with a deposit of lignite that was located many years ago. The interest attaching to a discovery of low-grade fuel was then materially less than that which now exists; since the importance of any source whatsoever of fuel that can be utilised for the generation of heat and power is greater now than at any period in the history of South Australia. The rise in the cost of imported fuel during recent years and the dislocation of industry through the interruptions in marine transport have drawn attention to all domestic sources of supply.

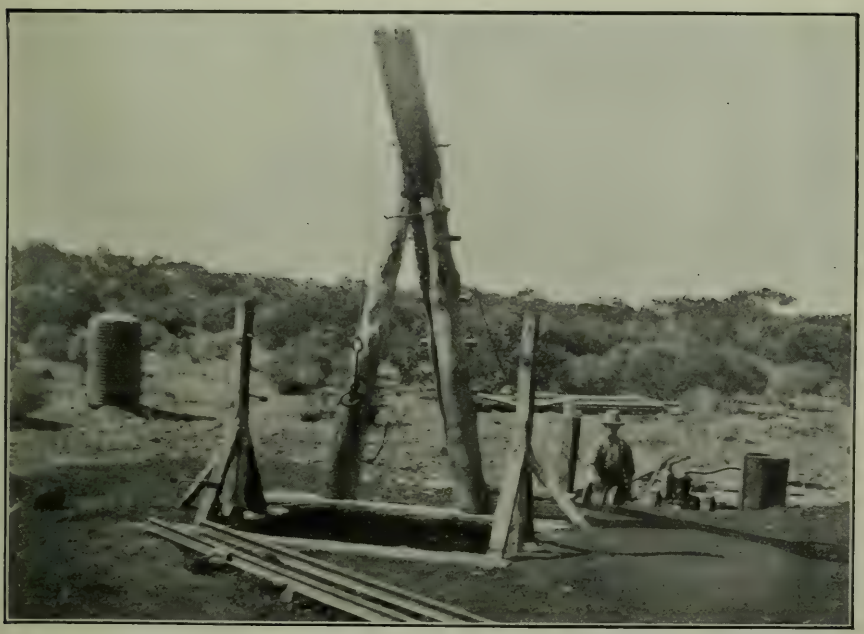
Moorlands Railway Station lies on the broad-gauge line between Adelaide and Pinnaroo, at a distance of 86¾ miles from Adelaide, and 11½ miles from the railway junction at Tailem Bend. Most of the prospecting work already carried out and now in progress is confined to the north-western corner of the hundred of Sherlock and the immediate vicinity thereof.

The geological features ascertainable at the surface give no indication of the lignite which occurs at a comparatively shallow depth. The soil is a discontinuous mantle of sandy loam which merges into unconsolidated drift sand in some places, and in others disappears altogether, leaving travertine limestone exposed at the surface. This limestone extends beneath the sand and sandy loam, and has been found in the excavations made in search of coal. Superficially it is hard and tough, but beneath the crust it is friable and in several places nodular. The thickness ranges from a few inches to several feet. Below the limestone the shafts and bores have penetrated white and variegated clays before reaching the lignite, and, after traversing the latter, have again entered clay beds.

These sediments certainly belong to the upper part of the Tertiary system, but the exact horizon has yet to be determined.

The lignite near Moorlands was discovered in a well sunk in search of water in the western part of section 53, hundred of Sherlock, close to the boundary between that hundred and the hundred of Seymour. A little boring was done in 1913 along this boundary to test whether the lignite extends to the westward. This boring, as reported to the writer who visited the locality while the work was in progress, resulted in disappointment,

RECENT WORKINGS OF THE TAILEM BEND COAL AND OIL COMPANY.



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since the lignite appeared to have diminished in thickness almost to the vanishing point or to have suffered almost complete erosion at the locality prospected. One of three bores is stated to have proved a thickness of only 4in. at a point about 6 chains W.S.W. of the well mentioned above. The other two bores were stated to have failed to prove any lignite. Work at this place was temporarily suspended, and has not been resumed till quite recently. A shaft has been started in the immediate vicinity of these bores to the south-west of the well in section 53, hundred of Sherlock. At the time of the writer's latest visit it had reached a depth of 25ft. After penetrating a few inches of sand and 5ft. of limestone, the shaft-sinkers entered variegated clays containing concretions of ironstone. A borehole only 3 chains N. 30° W. of this shaft is now being drilled.

Recent hand-boring operations within section 53, hundred of Sherlock, are reported to have been more successful, the figures supplied with regard to these boreholes being as follows:—

Number of Borehole.	Total Depth in Feet.	Overburden above Lignite in Feet.	Thickness of Lignite in Feet.	Remarks.
1	105	44	45	Bottom in white clay
2	98	43	27	Bottom in white clay
3	—	—	—	In progress
4	101	45	16	Bottom in white clay
5	—	—	—	—
6	—	65	—	Coal entered, in progress
7	94	50	24	Bottom in black clay
8	—	—	—	In progress
9	—	—	—	In progress

The area embraced by this series of boreholes is approximately 120 acres.

The lignite penetrated by the boreholes could not be observed and separately sampled. This will be possible when prospecting shafts have been sunk in the area explored by boring.

The only exposures of the lignite available for examination and sampling are those in the shaft where the discovery was first made. An oil engine, deep-well pump, and blower have been installed at the shaft, and a little driving has been done in the body of the lignite at a depth of 57ft. 6in. from the surface. The shaft is timbered to a depth of 45ft., and below that depth the lignite is exposed.

One drive in a direction bearing N. 75° E. extends for 20ft. from the centre of the shaft. The other drive is 15ft. 6in. in length along a direction bearing S. 8° E., at a point 8ft. east of the centre of the shaft. The lignite exposed in the workings is of rather variable appearance. The dull earthy and structureless body of this brown coal contains fragments of partly carbonised wood in which the fibres are plainly decipherable. There are a few irregular-shaped pieces of lustrous lignite and many ovoid blebs of resin disseminated through the bed. The coaly matter contains pyrites disseminated through the body of the carbonised wood, and also in seams, lenticles, and other concretionary forms. The proportion of the pyrites present is relatively large. Clay is present in bands, one of which in the drives is well defined and continuous round the exposure. Fossil leaves occur in the shaly bands. The apparent dip of the bed, judged by the clay

band in the drives, is at a low angle to the north-east. There is a considerable quantity of salt water in the lignite bed, and the pump is reported to have been raising from 400galls. to 600galls. per hour while at work. The salinity of the water was tested in 1910, when the results of a departmental analysis showed the presence of:—

Ferrous sulphate	28.72	grains per gallon
Aluminium sulphate	56.74	" "
Calcium sulphate	159.05	" "
Magnesium sulphate	242.72	" "
Magnesium chloride	173.77	" "
Sodium chloride	1759.55	" "
Silica	2.80	" "
Total	2423.35	" "

or 5.53 ounces per gallon.

The lignite is saturated with water, and the samples, which were sealed in the workings before the moisture had evaporated, show a content of about 50 per cent. of water. The loss of a portion of this moisture when the lignite is raised to the surface causes the shrinkage cracks and the disintegration of the fuel.

If the lignite is worked by stripping away the overlying sediments and removing the fuel by open-cut mining, the percentage of moisture will probably fall a little below the figures shown in the table of the composition of the lignite as now mined. It is probable also that, with more extensive underground workings and continuous pumping, the moisture content would be lowered to some extent.

The non-combustible matter that is shown in the analyses as "ash" is relatively high, and becomes a very bulky ingredient when the moisture in the fuel is reduced by evaporation. Possibly the percentage of ash can be reduced by picking out the shaly material when the coal is worked, and possibly also the percentage of pyrites can be lowered in the same way or by the adoption of some method of concentration. The ash is useless matter that should be rejected if possible. It consists of disseminated silt and defined shaly bands, and perhaps it may prove possible to remove only the latter bands by hand-sorting during mining. The iron pyrites, on the other hand, may have a positive value if it is found to be disseminated through the whole extent of the seam and to be recoverable on a commercial scale. Attention has been given recently to the recovery of pyrites from coal in the United States of America, with the object of utilising it in the manufacture of sulphuric acid. The conclusions arrived at are favorable to the use of pyrites occurring with coal for the purpose mentioned; and investigations have shown that, on the whole, the content of sulphur is sufficiently high, that the carbon content of properly-dressed pyrites concentrates from coal is not excessive, and that very little arsenic and phosphorus occur in pyrites obtained from coal. Several samples were taken in the workings, but the sites selected for sampling are all within a few feet of one another. The results of the analyses show that a marked variation in the content of ash takes place within a very short distance.

The description of the samples is as follows:—

Sample Number.	Thickness Sampled.		Remarks.
	Ft.	In.	
1	3	8	Face of E. drive, from top to clayband.
2	2	6	Face of E. drive, from clayband to floor, with all shaly matter.
3	3	0	Face of S. drive, from top to clayband.
4	3	2	Face of S. drive, from clayband to floor, with all shaly matter.
5	5	6	N. wall of E. drive, near shaft, nothing excluded
6	8	0	Shaft, from top of drive to bottom of timber.

The samples were sealed in the mine in air-tight containers, and the results of the analyses of this lignite, "as mined," are given in the following table:—

ANALYSES OF LIGNITE AS MINED.

Sample Number.	Moisture at 105°C.	Volatile Matter.	Fixed Carbon.	Ash.
1	52·21	21·88	16·15	9·76
2	45·62	18·56	12·90	22·92
3	54·15	23·29	15·13	7·43
4	56·57	21·68	16·37	5·38
5	50·86	22·12	16·73	10·29
6	49·32	23·97	18·04	8·67

After air-drying in the laboratory, the samples were again analysed, with the following results:—

ANALYSES OF AIR-DRIED LIGNITE.

Sample Number.	Moisture at 105°C.	Volatile Matter.	Fixed Carbon.	Ash.	Sulphur.
1	11·67	39·60	30·78	17·95	4·88
2	7·54	30·79	22·86	38·81	12·66
3	22·27	36·33	28·48	12·92	3·22
4	14·05	42·37	32·55	11·03	2·54
5	11·14	39·61	30·70	18·55	4·26
6	12·47	41·09	31·68	14·76	4·35

In giving consideration to the best method of utilising the lignite in the event of a large tonnage being proved, and in the event of the quality being on the average sufficiently good to justify development on a large scale, the practice of other countries should be kept constantly under review.

It is not probable that any one method of utilisation will be followed to the exclusion of all others. Rather does it seem probable that more than one method will be adopted to generate power from this fuel, provided always that it can be shown that different methods of utilisation are applicable to this particular lignite.

existence of "clay and lignite," "black clay," or "ligneous clay" between given depths. The information afforded by such records is of value chiefly for the data as to the depths at which lignitic material has been found, and as to the presence of water that might interfere with mining operations.

It will be apparent from the foregoing report that there is much to be done before the deposit of lignite near Moorlands can be said to have been prospected. The activity now being displayed gives promise of the early accumulation of data that will determine the importance of this field as a source of fuel.—(27-4-20.)

REPORT ON THE CLAYS WORKED BY THE LONGWOOD TESSELLATED TILE COMPANY, LTD., AT LONGWOOD.

The area worked by the Longwood Tessellated Tile Company, Ltd., is almost wholly embraced within the boundaries of sections 333 and 334, hundred of Noarlunga. Two mineral leases, Nos. 1854 and 1870, comprising 22 acres in all, are held by the company. The works are situated within section 1058, hundred of Noarlunga.

The rocks in this area are pale-colored slates merging into argillaceous sandstones. The texture of the component beds is somewhat variable, and the composition differs from bed to bed through differences in the proportions of clay, mica, and silica in the several layers. The formation has a strike between N. 30° E. and N.E., and a dip towards the S.E. at angles of from 30° to 40°. The slates have been intersected by quartz veins, and the latter have been prospected in the past without any recorded success. There are few outcrops of the slate which is covered by a mantle of ferruginous clay, in which are embedded fragments of the hardest bars from the rock beneath and pieces of the quartz veins.

A tunnel, about 10 chains in length, has been driven right through the hill in section 333 to test the quartz veins, the maximum depth below the surface being about 80ft. The tunnel has now fallen in at each end, but can be reopened without difficulty; near the southern entrance to the tunnel is an old shaft, also fallen in. On the northern fall of the hill is another shaft, now in disrepair, and said to be connected with the tunnel and with other workings below the tunnel level. The trend of the tunnel is a few degrees west of north, so that it crosses the bedding planes of the slate, and exposes a number of the beds in this formation. Some of the material raised from the shafts is used for making tiles, and the superficial ferruginous clay is also worked for this purpose. The weathered clay slate varies slightly in composition from one component bed to another, and on the northern fall of the hill becomes highly siliceous. This latter variety is a sandstone with argillaceous matter filling the spaces between the grains of silica. It is non-plastic and refractory.

The following table shows the composition of various portions of the slate formation, the first three samples being from the southern end of the tunnel, and No. 4 of the series being the sandy variety from the northern side of the hill. While no estimate of quantities can be given for lack of exposures, it is reasonable to suppose that very large quantities of the clays represented by the samples can be obtained at this place.

RECENT WORKINGS OF THE TAILEM BEND COAL AND OIL COMPANY.

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Composition.	No. 1.	No. 2.	No. 3.	No. 4.
	Per cent.	Per cent.	Per cent.	Per cent.
Silica	69·52	74·22	71·92	81·54
Alumina	20·83	17·80	18·41	12·72
Ferric oxide	0·42	0·81	1·01	0·22
Magnesia	0·60	Nil	0·18	Nil
Lime	0·04	Nil	Nil	Nil
Soda	Nil	0·01	0·50	0·22
Potash	2·46	2·08	2·81	1·24
Water at 100°C.	0·38	0·18	0·09	0·09
Water over 100°C.	5·26	3·61	4·31	3·37
Carbon dioxide	Nil	Nil	Nil	Nil
Titanic dioxide	0·85	0·68	0·71	0·30
Chlorine	Nil	Nil	Nil	Nil
Total	100·36	99·39	99·94	99·70
Total fluxes	3·52	2·90	4·50	1·68
Color—				
Unburned	White	White	White	White
Burned at 1,000°C., oxidising atmosphere	White	Light pink	Light pink	White
Burned at 1,450°C., reducing atmosphere	White	White	Light grey	White
Fusibility—				
Test at 1,450°C. (approx.)	Fused, non-refractory	Not fused	Not fused	Not fused

From these analyses and tests it appears that the first three clays are not suitable for making any refractory articles. The proportion of total fluxes is such that, even where the clay has not fused at the temperature of the test, refractory qualities cannot be expected. The fourth clay might serve a useful purpose as an ingredient of a siliceous admixture possessing a refractory nature; but it is a non-plastic material for which, by itself, a use is difficult to indicate.

The first three clays are such as may be used in the manufacture of stoneware—the opaque and practically impermeable variety of pottery having a vitrified body. The samples taken for assay were perhaps a little cleaner than the bulk of the material as mined, and consequently gave burned products rather paler than would be obtained in actual practice. By careful selection of the varieties least stained with oxide of iron and by washing the clay to remove the iron oxide occurring in the joint planes, these clays might be utilised in the manufacture of cream-colored ware.

The iron-stained superficial clay was not separately analysed. It is quarried as required, and is used for making red tiles of good color, and, with the addition of manganese oxide, for the manufacture of black paving tiles. The supply appears to be large, and the requirements of the works are easily satisfied from a face 4ft. in depth.

The property is equipped with a steam power plant and also a 9 h.p. oil engine, a Chilian mill, blunger, pulveriser, two kilns, one power press, and five hand presses for making flooring tiles.

The clay is thoroughly mixed and crushed before washing in the blunger, whence it passes to an 80-mesh sieve. The oversize is rejected, and the undersize passes to settling vats, where a layer about 3in. deep accumulates. This layer is allowed to dry, and breaks up into cakes, which are lifted out and stacked for air-drying. The dried clay is raised by an elevator, crushed in the Chilian mill, whence it passes to a Boulton's pulveriser. The clay is subsequently damped and resieved before going to the presses. The capacity of the Pullan and Mann's power press is 1,000 octagon-shaped paving tiles per hour, and a larger number of smaller sizes. The clay used in the making of the saggars in which the tiles are burned is of local derivation, and has proved satisfactory. In addition to the paving tiles, agricultural pipes and garden edging tiles have been made; but operations are at present restricted to the manufacture of flooring tiles, which are in strong demand. Tiles of pale buff, red, and black colors are made, and a bluish-grey variety is obtained by reburning the buff-colored tiles in a reducing atmosphere. These latter tiles are exceedingly hard and dense in texture, and have given excellent service in Government buildings, for which they have been specified. (18-5-20.)

REPORT ON THE NATURE AND ORIGIN OF OILY MATTER FOUND ON THE SHORE AT ENCOUNTER BAY AND KANGAROO ISLAND.

During the month of May, 1920, reports were received of the occurrence of oily matter on the beaches near Victor Harbor and Port Elliot. The oily substance was found between high and low water marks in patches covering an area of from 1 sq. in. up to 25 sq. in. On the occasion of a visit to Victor Harbor a number of these oily patches were found at high-water mark on the beach close to the northern end of the causeway connecting Granite Island with the mainland. A few similar patches were observed between this point and the mouth of the Hindmarsh River, but none between the latter place and Port Elliot. Nor was any oily matter seen between the causeway and Rosetta Head. From information received, however, it appears that the oily matter was more widely distributed, and had been seen previously on the beaches which showed no trace of it on the occasion of the writer's visit. Subsequently similar material made its appearance on the northern shore of Kangaroo Island, and samples forwarded thence to the Department of Mines are of the same nature as those collected at Victor Harbor.

All the oily matter seen was entangled with seaweed, and, when gathered, contained a considerable proportion of beach sand. This material was forwarded to the Director of Chemistry for chemical investigation, which has been carried out with the results set forth in the following report:—

"Each of the samples consisted of sand, seaweed, water, and black oil. The quantities of oil in the different samples varied from 8 per cent. to 14 per cent.

"A portion of one of the samples distilled from a brine bath gave no distillate till the temperature of boiling water was reached, when water came over with a small quantity of an oil similar in character to kerosine. By continuing the distillation from 100° C. up to 315° C. a further quantity of oil distilled over. This treatment "cracked" the petrolene and asphaltene

bases. The whole of the oils thus obtained in this distillation were redistilled and fractionated, with the following results:—

Distilling up to 150° C.	=	9.7 per cent.
150° C. to 270° C.	=	49.2 per cent.
270° C. to 290° C.	=	20.8 per cent.
Residue and loss	=	20.3 per cent.
		100.0 per cent.

"The flash point of one of the original samples was found to be over 100° C., but the exact flash point could not be determined owing to the presence of water.

"The oil from a representative sample was extracted by solvents and the resulting solutions analysed. From the results obtained the following constituents of the 'oil' are estimated:—

Black oil =	Petrolene, 85.0% =	Naphtha	= nil
		Kerosine	= 26.6%
		Lubricating oil	= 27.8%
		Paraffin wax .	= 2.8%
		Pitch	= 21.5%
		Undetermined and loss . ..	= 6.3%
	Asphaltene, 15.0% =	Asphaltum ..	= 15.0%
			100.0%

"The above analysis is to be regarded as only an approximate estimation, and should be checked when larger and purer samples of the oil are available. From the results of the analyses there can be no doubt that the oil is a crude petroleum oil. Crude petroleum oils and petroleum residual oils are largely used nowadays as fuel, both for internal combustion engines of the Diesel type and for firing steam boilers in place of coal fuel. Many steamers now use oil fuel, and most sailing vessels carry auxiliary engines, for which black oil fuel is frequently used. It may be, therefore, that the oil found on the beach near Victor Harbor has come ashore from some vessel, but looking at the question only from the chemical point of view, it is just as probable that the oil is derived from a natural source not very far away."

From these results it is clear that the origin of the oil must be discussed from the geological aspect. The occurrence must be reviewed in connection with the geological features of the shores on which it is stranded, and its recent appearance must be noted.

The geological structure of Victor Harbor does not lend support to the hope that a local source of petroleum may be found to have yielded the oil All the data available point to the improbability of a local place of origin The underlying rocks of the district are much altered sediments—quartzites and mica schist—which have suffered intrusion by the granite of West Island, Rosetta Head, Wright Island, Granite Island, and Port Elliot. None of these Pre-Cambrian rocks can be regarded as sources of petroleum. Overlying them is a vast exposure of glacial beds—boulder clays and sandstones —which have been traced by Professor Howchin across the Inman Valley and northwards to the headwaters of the Finniss River near Mount Compass

and Ashbourne. These beds, which are in all probability of Permo-Carboniferous age, were formed under conditions that did not permit the accumulation of any appreciable quantity of organic material. The carbonaceous beds found intercalated with the Permo-Carboniferous glacial beds of eastern Australia are not known in South Australia. There are no indications, of which the writer is aware, of oil in the country covered by the South Australian Permo-Carboniferous glacial beds, which are in places deeply dissected by stream channels.

Boreholes have been drilled to find out whether carbonaceous beds are associated with the glacial deposits, but only negative results were obtained. One borehole was drilled to a depth of 950ft. at a point within section 415, hundred of Encounter Bay, in 1892-1893. Another borehole in the near vicinity reached a depth of 570ft. Both of these holes were abandoned through the loss of the tools. A third borehole, drilled in 1895 within the boundaries of the water reserve in section 581, reached the underlying slate at a depth of 964ft., without evidence of carbonaceous material having been met.

There are not known to be any petroliferous beds in this State whence oil might have migrated into the sandstones associated with the glacial clays.

To the eastward of Encounter Bay lies the great Tertiary basin traversed by the River Murray, and extending into Victoria and New South Wales. Near its western margin—between the Kingston-Naracoorte railway and the Mount Lofty Ranges—the basin is for the most part shallow. At many places the old bedrocks (quartzite, slate, and granite) outcrop and several boreholes drilled through the Tertiary beds have reached bedrock. Farther to the eastward a greater depth of Tertiary sediments has been proved. Very many boreholes drilled by private individuals and by the State in search of water have failed to show any signs of petroleum.

The geological structure of the northern portion of Kangaroo Island is similar. The old mica shists and quartzites, with granitic intrusions, extend from the eastern end of the island to Nepean Bay, where they are overlain by recent sediments. At Kingscote the Permo-Carboniferous glacial beds have been proved by boring to be about 1,000ft. in thickness. They are covered by sandstone and Miocene limestone and basaltic flows.

All the geological data that have been gathered with regard to these districts fail to lend support to the hope of obtaining petroleum from any of the formations represented on the mainland and on Kangaroo Island. Moreover, the very limited distribution of the oil, as regards the time factor or the dates of its appearance, is a potent argument against a natural source. The material is of striking appearance, and could hardly fail to have attracted attention had it appeared previously on any frequented part of the shore. Yet no such occurrence has been recorded prior to that now under discussion. And the first appearance of the oil has been coincident with a period in which vessels using oil fuel have been in South Australian waters, so that it is imperative that the possibility of distribution influenced by human agency should be carefully considered. It is particularly to be noted that the newly-found oil differs in this respect from the asphaltic bitumen which has been found from time to time on the beaches of South Australia ever since the earliest days of its occupation.

To speculate upon the source of sea-borne material cast up on the beaches is not likely to be a profitable undertaking, even where there does not seem to be a strong likelihood of human intervention. It is not possible to indicate with certainty the source of the asphaltum that is stranded along the southern coast of Australia, from Fremantle in Western Australia to Cape Otway

in Victoria, on the coast of Kangaroo Island, as well as on the western shores of King Island and Tasmania. By plotting the positions of all known sources of petroleum and asphaltum on a map of the world, showing also the surface ocean currents, no certain solution of this problem is yet obtainable. The main drift of the oceanic waters is known to be from west to east in the Southern Ocean; and this easterly drift is modified by an eddy which produces a current moving from south-east to north-west along the South Australian coast. Hence jetsam having a source to the westward of any point on the coast of this State may be brought eastwards until near the shore, to be caught in the return current and swept along in a north-westerly direction until stranded. The position at which any material finds a resting place is dependent not merely on its place of origin, but also on the ever-varying meteorological changes which affect the currents.

In deciding on the advisability of prospecting for petroleum by boring, the geological features of any district should be given first consideration, since they have vastly greater significance than the appearance of petroliferous jetsam on the shore. If no encouragement towards the expenditure of capital in boring for oil can be obtained from the study of the geology, as in the case under discussion, it is best to face the fact that there exists much negative evidence to be balanced against the evidence afforded by the presence of sea-borne oil of unknown origin. (6-7-20.)

NOTES ON RECENT DISCOVERIES ON THE EUKABY FIELD.

A party of prospectors from the Broken Hill district visited the Eukaby field and made a new discovery, which has led to the prospecting of a considerable area embracing the old mines and the surrounding country. The mineral claims recently pegged out cover the old leases and extend beyond their boundaries.

Eukaby Hill is situated on Baratta Run, near the source of the Siccus River, and is distant about 9 miles from Baratta Head Station. It is approached from the Broken Hill railway *via* Waukaringa and Koonamore Station, or from the Peterborough—Port Augusta railway at Carrieton or Orroroo.

The first discoveries of silver-lead ore were made many years ago, and several shafts were sunk and a little underground development was carried out, but the field has been practically abandoned for about 30 years.

At the time of the writer's visit there were 17 men on the field, and the work of prospecting had only just started.

From the very limited exposures of the newly-discovered lodes the conclusions to be drawn are no more definite than can be formulated in respect of prospects in the earliest stages of exploration. It is too soon to calculate reserves of ore, and it is not wise to try and establish comparisons with developed fields, even as regards structural features.

The country rocks carrying the veins of silver-lead ore are greenish-grey slates, which have a general strike of from N. 60° E. to N. 72° E., and a steep dip to the south-south-east. This slate decomposes at the surface, forming a reddish-brown loam with travertine limestone, but the thickness of soil is small and the upturned edges of the slate are reached within a few feet, even where there are no surface outcrops.

The mineral veins occupy fissures that have been formed in the slates, and have been influenced very noticeably as regards both dip and strike by the bedding-planes of the slates. At the same time it should be noted that there are definite indications of the brecciation of the slates, and there are veins which cross the bedding-planes. It is clear from these features that the veins have been formed subsequently to the deposition of the beds of argillaceous material which constitute the slate formation. The veins are for the most part narrow when considered individually, but in some places there are a number of veins approximately parallel to each other and close together. It remains to be seen whether the proportion of galena in the zones carrying these parallel veins is sufficient to permit the working of the whole formations.

The assemblage of minerals present in the vein-filling throughout the field is practically constant, comprising quartz, siderite (with some ankerite and calcite), and galena. The oxidised cappings of the lodes carry also limonite, psilomelane, cerussite, dark-grey pyromorphite, and a little anglesite. No silver-bearing minerals were separately observed, but by assay it was found that in a number of cases the proportion of silver to lead is about half an ounce of silver to the unit of lead. In the oxidised ore the tendency seems to be towards impoverishment in silver. Traces of gold were found by assay to be present, but in no case was the proportion of gold to silver noteworthy. At a few points traces of copper carbonate were seen in the oxidised ore.

The discovery leading to the rejuvenation of the field was made quite close to some of the old workings in the western part of the area formerly held under mineral leases. Slugs of almost pure galena were found partly embedded in the soil for a distance of many chains along the course of a well-defined vein. One of these slugs, forwarded to the Department of Mines, was found to contain 82 per cent. lead and 37ozs. of silver per ton. Three mineral claims, Nos. 11256, 11294, and 11299, have been pegged out by the discoverers, and the work of opening up the lode has been begun. The general trend of the lode is N. 68° E. (magnetic bearing), and small slugs of galena have been found for a distance of 100ft. to the south-west of the south-western boundary of the central mineral claim (No. 11256). On this boundary a shallow excavation shows semi-oxidised ore over a width of 6ft. Some fragments of the picked ore, consisting of galena and cerussite, were assayed and found to contain 77.2 per cent. lead, 46ozs. silver per ton, and a trace of gold (not exceeding 1dwt. per ton).

The lode at this point appears to have a brecciated structure, and contains veins of clean ore recoverable by hand-picking as well as milling ore. The excavation, when seen, was only 3ft. deep. Immediately to the north-east there is a shallow trench exposing veinlets of galena over a width of 21ft. Another pit, 3½ chains from the boundary, is 5ft. 6in. deep, and exposes a brecciated formation over a width of 5ft. The full width of the formation is not revealed in the opening, for ironstone is outcropping 10ft. farther to the north-west, and traces of galena have been found in the formation for 10ft. on the south-eastern side of the pit.

The course of the lode can be traced practically continuously by the presence of slugs of galena and traces of vein matter in place to the spot, 13 chains from the south-western boundary, where the galena was first discovered on the claim. At this place, where 2 tons of galena were gathered on the surface, a trench 6ft. deep has been made along the course of the lode. The principal vein is composed of clean galena up to 12in. in width, and is exposed for a length of 27ft. It has a very steep dip

towards the south-east. On the footwall side there are at one point subsidiary veins over a width of about 3ft., the formation being one from which first-class ore can be obtained by hand picking.

Fragments of the high-grade ore from this place were assayed and found to contain 47.2 per cent. lead, 28ozs. 10dwts. silver per ton, and a trace of gold (not exceeding 1dwt. per ton). Beyond this trench towards the north-east are two other small excavations from which galena has been recovered. The total length over which the formation has been traced is about 16 chains.

From the several workings along the course of this lode a parcel of ore was dispatched to the smelters at Port Pirie. The net weight of this parcel was 6.44 tons, and the ore was found to contain 65.3 per cent. lead, 32.1ozs. silver per ton, no zinc, and 8.8 per cent. sulphur. The total content of metals in the parcel was therefore 4.205 tons of lead and 206.7oz. of silver. Traces of vein-matter of the same general type have been found in the southern part of mineral claim No. 11256, but the veins have not yet been opened up.

To the south-east of the three claims to which reference has been made above are two mineral claims held by virtue of miners' rights Nos. 7241 and 7240, on which some new discoveries have been made. At a point 3 chains to the south-south-east of the southern corner of mineral claim No. 11256 is a trench 6ft. 6in. deep along the course of a vein of clean galena 6in. wide. The strike of the vein is N. 65° E., and the dip is to the the S.S.E. at 73°. This lode has not yet been continuously followed to the south-west, but siliceous vein matter of the normal type outcrops at intervals for 9 chains, and is probably part of the same lode. The lode has been traced for about 5½ chains to the north-east, and at that point it disappears beneath a cover of soil. A trench along the lode, where last seen, shows a vein from 2in. to 3in. in width, carrying clean galena. Still further to the north-east siliceous vein-stuff, with a little galena, is visible, but the connection between this lode-matter and the south-westerly occurrences is not yet proven. Similar vein-stuff, showing traces of galena, has been discovered in the adjoining claim to the north-east, miner's right No. 7240, but little work has yet been carried out there. An old trench has been extended, and semi-oxidised ore containing pyromorphite has been found.

To the east of Eukaby Hill, on the steep eastern slope of a low hill, an open cut is being carried into the hillside on mineral claim No. 11295. This opening was started on a vein said to have been from 4in. to 6in. in width, where it was formerly exposed many years ago. The width at the point reached on the occasion of the writer's visit was 15in. The ore consists mainly of galena, with which are associated quartz and siderite, as elsewhere on the field. The main vein has a strike of N. 70° E., and dips at 75° with the slate towards the south-east. But there is a subsidiary vein dipping at a flat angle to the north-west, and this vein will probably join the other at a depth of a few feet. The galena carries vughs partly filled with crystals of cerussite. A parcel of about 5 tons of first-class ore from this place has been hand-dressed ready for dispatch to the smelters. A sample composed of fragments of the picked galena was found to contain 64.1 per cent lead, 27ozs. 10dwts. silver per ton, and a trace of gold (not exceeding 1dwt. per ton).

The lode does not outcrop on the hill immediately above the workings, but other vein-matter of similar general type and carrying galena has been recently discovered at two places between the workings mentioned and Eukaby Hill.

Immediately to the north of Eukaby Hill, within the boundaries of mineral claim No. 11291, a little new work has been done in tracing the course of a lode opened up 30 years ago, and a little high-grade galena has been obtained by hand-dressing the material formerly raised and stacked on the surface. One of the old excavations shows a formation about 30ft. in total width, carrying several narrow seams of galena and cerussite. To the south of this excavation, and distant from it about 200ft., a fresh discovery of lead carbonate has been made in a vein 6in. wide, but the lode has not yet been followed downwards nor along its course. This claim occupies the site of several of the workings dating from the period of former activity on the field.

A little recent prospecting has been done to the west and north-west of Eukaby Hill, but so far without very promising results. To the west and south-west of the principal fresh discovery on mineral claim No. 11256, prospecting operations are in progress. Veins containing the typical minerals found in the district have been located, but the amount of galena in them was insignificant in all excavations that had been made when the field was visited.

The newly-found lode in mineral claim No. 11256 is certainly an important discovery that is worthy of systematic and vigorous development. While the data are not yet available for the discussion of ore reserves and probable productivity, the continuity of the lode over a considerable length and its width at several points are such that the owners should sink and drive on the lode at more than one place. Crosscuts, to test the width and grade of the formation, should be made at short intervals. Only when this work has been performed will it be possible to regard the property as a mine the merits of which are to be judged from the ore exposed. This object should be kept in view in all the exploratory work below the surface.

The future of the other newly-discovered lodes is still less capable of prediction. Only the very earliest stage of prospecting has been reached, and in many cases the veins hitherto exposed at the surface are narrow and contain a small proportion of galena. It is important to discriminate between the vein and the ore-shoot. All or some of the minerals present in the type that is developed on the field may be present in any particular vein. Thus some veins consist almost wholly of quartz, with traces of siderite, altered in part to limonite. Others contain galena in addition, and these should be carefully followed at the surface with the object of discovering the places where the proportion of galena is highest, before deeper work is undertaken.

The prospects of the field as a whole will be decided by the results of the development of the individual properties, and cannot be foretold until much more work has been carried out. There are many new veins already discovered, and these should receive at least the attention required to show whether they carry enough galena near the surface to justify deeper exploration. Those portions of the veins that actually carry lead-bearing minerals in important proportions should be opened up in length and in depth and the work of exploration should follow the veins as far as is practicable.

The time is a favorable one for the development of a field to produce silver and lead. The price of standard silver per ounce in London on July 13th, 1920, was 4s. 5⅝d., and of spot lead was £34 15s. per ton. While the price of each metal has fallen within the last few months, the figures now quoted are much above the average over a long period of years.—(15-7-20.)

REPORTS

BY THE

Deputy Government Geologist (R. Lockhart Jack, B.E., F.G.S.)

REPORT ON A DISCOVERY OF ASBESTOS ON SECTION 228, HUNDRED OF JELLICOE.

An asbestos-bearing zone has recently been opened up on this section, the mineral rights of which are alienated from the Crown. The western half at least, and the road to the west, is occupied by a bed of magnesian limestone or marble, more or less completely altered to silicious magnesian minerals and in places showing a considerable quantity of free silica.

The surface was a ploughed field, and little can be seen except in three openings and in the bed of a creek. These exposures show that the altered magnesian limestone carries small veins of asbestos where alteration has been most intense, but not in sufficient quantity to be workable except in two openings on a zone of asbestos from 2ft. to 3ft. thick, striking N. 25° W., and dipping about 30° to the W.S.W., and apparently conforming in strike and dip with the surrounding rock. The zone shows evidence of movement, and has apparently been the channel through which solutions have passed to cause the alteration of the magnesian limestone into asbestos, and talc of greenish tinge. Such a plane of movement may reasonably be expected to persist for a considerable distance longitudinally, and on the dip. Both above and below the asbestos-bearing zone there has been development of talc, but to a less pronounced extent, and there are also visible the granules derived from the breaking down by weathering of a saccharoidal marble.

The deepest working is about 8ft. in depth, and shows 2ft. to 3ft. of asbestos rock. This rock is made up of a large proportion of asbestos sheaves disposed in all directions (mass fibre) with a talcose gangue. The sheaves of fibre run from 2½in. long by 1in. in diameter downwards, and when broken up are found to consist of a very silky white fibre of good color and tensile strength, but it fluffs up when strongly rubbed between the fingers. The depth is insufficient for the development of the full strength of the fibre, the portion of the vein nearest the surface containing much weaker fibre than that in the bottom of the excavation.

Two small dumps of roughly broken and screened material were on the surface, apparently treated on a ¼in. to ⅜in. sieve. The coarse heap, about one-fifth of the original bulk, consisted of sheaves of asbestos and coarse particles of gangue and ore, the fines heap contained much fine asbestos.

Samples were taken as follows, and were treated by the Government Metallurgist on the lines indicated in his report:—

No. 1.—Average sample over 3ft. of ore body, asbestos in upper portion somewhate perished.

No. 2.—Fines screened from crude ore.

No. 3.—Coarse screened from crude ore.

Notes on the Treatment of Samples of Asbestos Ore.

Sample No. 1.—Run of mine ore.

(*a*) The sample as received was put through the jaw breaker and reduced to a maximum size of about $\frac{1}{2}$in. The crushed sample was then sieved on a sieve having openings 1-10in. square. A certain amount of fibre matted together, and was removed, giving 1.8 per cent. of fibre of a maximum length of about 1in. or a little over. The remainder of the material on the 10-sieve was passed slowly through the rolls set at about 1-16in., and the crushed product again sieved and picked. By this means 3.2 per cent. of fibre was recovered. After the operation 4 per cent. by weight of the crude ore still remained on the 10-sieve, and probably 10 per cent. to 20 per cent. of this would be recoverable as fibre with proper appliances. That total quantity of fibre recovered was therefore 5 per cent. by weight of the original ore.

(*b*) In this test the treatment was slightly modified. The sample after passing through the jaw breaker was shaken up on a sieve having openings $\frac{1}{4}$in. square, and 1 per cent. of fibre was picked out. The remainder of the material on the $\frac{1}{4}$in. sieve was pounded (not ground) in a mortar, and then returned to the sieve. In this way 0.4 per cent. was recovered. This scheme was repeated with $\frac{1}{8}$in. and 1-10in. sieves, and the pounded material returned from time to time to the $\frac{1}{8}$in. sieve to facilitate the picking process. By this means an additional 6 per cent. of fibre was recovered, making a total yield of 7.4 per cent.

Remarks.—So far as could be observed, the fibre was of good quality, but rather short, no pieces much over 1in. in length being noticed. The higher yield in test (*b*) was due to somewhat closer picking, forceps being largely used instead of the fingers only, but also to the pounding received in the mortar, whereby the fibre bundles were burst up, and so rendered easier of removal. It is probable that similar results would have been obtained by successive passages through the rolls, but in that case the losses in weight would have been very appreciable unless a very large sample was dealt with. Using a mortar there were no losses on this score. It may be accepted, therefore, that the results of test (*b*) represent what could be obtained in practice with suitable machines, much more closely than those of test (*a*), and probably it would not be unreasonable to expect a yield of about 10 per cent. from material similar to that treated.

Two other samples were also examined:—

(2) The "fines."

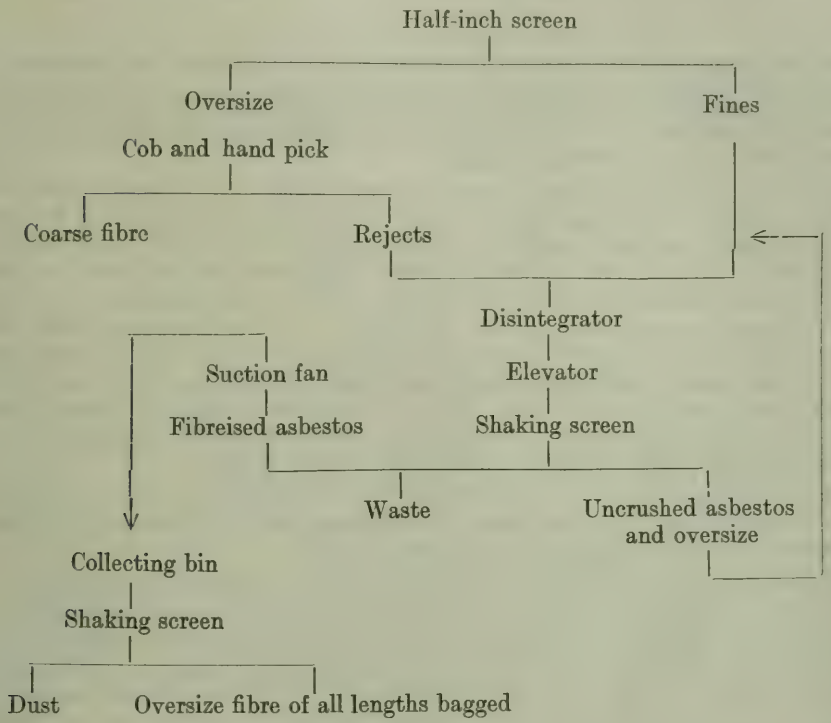
(3) A "coarse" sample from some cobbing and sieving process.

Both samples were very similarly treated to the run of mine sample, and the results were as follows:—(2) "Fines," 5.2 per cent.; (3) "coarse," 26 per cent. of fibre; giving an average for the whole of about 9 per cent. of fibre. In practice it would probably be possible to recover at least 30 per cent. from the coarse, and about 7 per cent. from the fines, giving an average of 11 per cent. to 12 per cent. of fibre. It was noted that the fibre from the coarse sample was apparently of much better grade for the most part than that obtained from "the run of mine."

J. D. Connor, Government Metallurgist.

The machinery available for this testing is not that which would be used in practical work, and destroyed a larger proportion of the fibre than would a specially designed plant, which would probably recover over 10 per cent. of fibre.

Machinery seems to be indicated on the following general lines. Owing to the relatively small size of the deposit (2ft. to 3ft. thick) capital expense should be kept low at the cost of lower efficiency than would be given by a more elaborate plant.



Before the erection of such a plant is undertaken there should be a sufficiency of ore proved to pay for the plant, and this proving can be most cheaply done by:—

(1) Trenching at intervals across the presumed course of the ore body until its full length and average width are known. At present it is only proved for a length of 45ft.

(2) After proving a reasonable length, sinking a shaft, preferably in the ore body, to prove the continuation and value of the ore body in depth.

The grade and size of that portion of the ore body exposed and the quality of the dressed product justify the opening of the deposit on these lines. (8-7-20.)

REPORTS

BY

The Chief Inspector of Mines (L. J. Winton, B.E.).

REPORT ON THE PROPERTY OF THE NEW HOPE SYNDICATE.

The mining operations of this syndicate have been carried out on private property belonging to Mr. Schwartz, the mining claim comprising part of section 1600 in the hundred of Gilbert.

The claim lies E.N.E. from Riverton, from which it is distant about six miles by road, the workings being on the W. slopes of the Belvidere Range. A vertical shaft has been sunk to a depth of about 50ft. to cut a small quartz vein which carries a little galena in places. This vein does not show on the surface, being covered by soil, but was disclosed by some costeens. At the point where the vein was cut by the shaft a drive has been put in towards the S. for a few feet, and the vein shows here as a ferruginous quartz seam approximating in strike and dip to the strike and dip of the country, and about 2in. in width. From it in places some small veins of ½in. or so of similar material cut through the country, which consists of soft ferruginous clay slate dipping to the E. at a steep angle.

Some specimens of galena veins some inches in width have been obtained from the workings, but at the time of inspection merely a few small crystals of galena were seen at places in the quartz vein.

At present the size of the vein and the amount of galena are too small to be of any economic use, and there does not appear to be any indication of increased size or value. If any further information is desired the best and cheapest way would be to drive N. or S. on the vein from the present 50ft. level, to find out if any favorable change occurred in the size and value of the lode. On present prospects, however, it does not appear to be worth while to spend much money on the show. (17-2-20.)

REPORT ON THE MOUNT SIENNA OCHRE MINE.

(*Vide* Record of Mines and Mining Review, No. 23.)

This property was originally known as the St. Patrick Mine, and was worked for gold. Later it was worked for ironstone flux and ochre, being then known as the Talunga Ochre Mine, and latterly as the Mount Sienna Ochre Mine. The property as held at present consists of a gold lease and two mineral claims.

The gold lease, No. 1470, of 20 acres, comprises gold section 323 and part of gold section 324. The mineral claims adjoin the gold lease on the north and south, respectively, mineral claim No. 11164, of 20 acres, being situated on section 2, and mineral claim No. 11165, of 20 acres, being situated on section 6397.

The principal workings are on the gold lease on G.S. 323, and are about three miles distant from Birdwood, a good road connecting the mine to the latter place. The country here is well timbered and comparatively flat, and the formation which is being worked, which strikes a little to the E. of N., can be traced on the surface as a gossan outcrop for a distance of eight chains. The dip of the body is S. of E., and near the surface the angle of dip is 25°, but in depth the lode dips at a steeper angle. The true width of the lode where it can be seen on the 80ft. level is about 20ft., but is not solid ironstone or ochre, as bands of clayey material occur irregularly throughout.

The ironstone or ochre occurs in seams and irregular masses through the formation, the seams in places attaining a thickness of 4ft. The footwall is characterised by the presence of large masses of soft white unctuous material, much resembling talc in appearance, but differing in chemical composition. Its analysis is approximately as follows:—

Water	12	per cent.
Silica, SiO_2	52	"
Alumina, Al_2O_3 (including a little FeO)	20	"
Lime, CaO		trace
Magnesia, MgO	15	per cent.

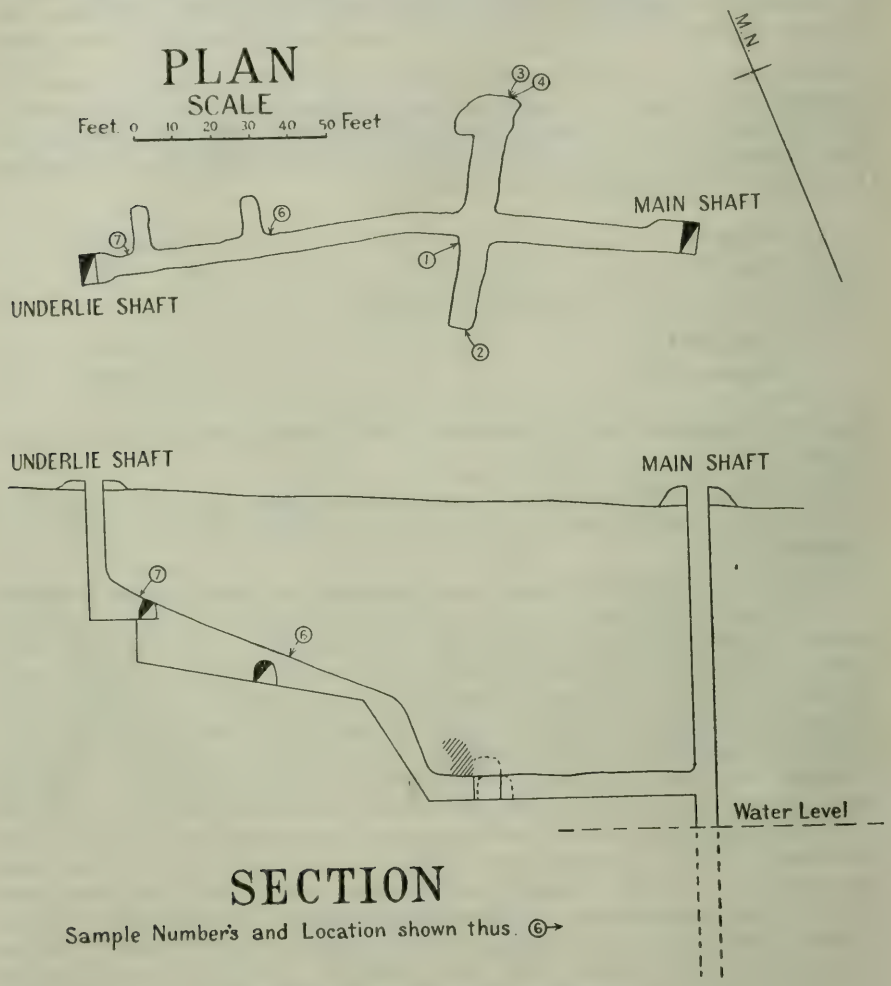
from which it appears to be a mixture of species rather than a distinct variety of rock.

The hanging wall country is decomposed sandstone and micaceous schist, and there is a considerable development of sericitic mica throughout the formation.

The lode is a deep-seated one of pyritic origin, evidenced by the occasional occurrence of pyrites in the workings and by the silicious sinter or skeleton masses of quartz left by the oxidation and removal of the once intermixed pyrites. Masses of this sinter-like quartz are found, sometimes showing some free sulphur. The outcrop of the lode is marked along the surface by various old workings, shafts, cuttings, and costeens, and from some of these old workings gold is said to have been obtained, but no authentic record is available, although the amount of gold is not considered to have been much. Towards the S. end of the outcrop a vertical shaft has been sunk to a depth of 50ft., in the hanging wall country, and a crosscut was carried in to the W. for a distance of 120ft. This crosscut is said to have cut an argillaceous sandstone carrying a small amount of ochre, close to the shaft, but these workings were not accessible for examination at the time of inspection. Farther N. some open cutting and sinking has been done on the lode, and it is from here that the gold is said to have been obtained. Very little work has been done between this point and the present workings, a distance of seven chains, with the exception of a little costeening at intervals.

The Main Workings.—These consist of two shafts and connecting workings. One shaft is known as the Underlie Shaft. It is sunk vertically to a depth of 36ft., and is then continued on the underlie of the lode for a distance of 140ft., at which point it connects with the 80ft. level from the main shaft. This latter shaft has been sunk vertically in the hanging wall country to a depth of 127ft. At a depth of 80ft. it connects with the workings from the underlie shaft, forming the 80ft. level. At the time of inspection the water level in this shaft was at 90ft. There are said to be workings below this level, but no inspection was possible.

The crossent from the main shaft at the 80ft. level has been driven to the W. through the hanging wall country, cutting the lode at a distance of 50ft. from the shaft, and drives have been put in N. and S. along the lode, the N. drive being in 33ft. and the S. drive 27½ft. at the time of inspection. The footwall of the lode shows in the face of the N. drive. From the back of the southern drive the lode has been stoped up for a few feet. Two short drives have also been put in to the N. from the underlie shaft, both of which show



The Mount Sienna Ochre Mine.

the presence of ochre. At the time of inspection ochre was being obtained principally from the N. drive at the 80ft. level. The ochre in this mine is limonite, of slightly varying shades of yellow to brownish-yellow, no natural red ochre having been seen in the workings. At one place in the underlie shaft some reddish material was seen, but consisted merely of clay, colored with a little natural red ochre, and is of no value as a pigment.

At the time of visiting, the ochre broken in the face of the N. drive was being screened, and the harder, coarser material was thus separated from the softer, finer material, being kept separate for selling purposes.

Sampling.—Strip samples were taken from various parts of the lode, the positions being shown on the accompanying section:—

TABLE OF ANALYSES.

W. S. Chapman.

Number of Sample	1.	2.	3.	4.	6.	7.
Width of sample	Inches. 30	Inches. 8	Inches. 16	Inches. 32	Inches. 42	Inches. 36
Ferric oxide, Fe_2O_3	62·8	35·2	56·4	75·6	74·8	76·4
Alumina, Al_2O_3	3·7	6·3	5·1	5·6	4·1	4·0
Silica (free), SiO_2	24·2	48·5	26·5	7·6	5·3	6·9
Silica (combined), SiO_2	0·4	2·0	0·8	0·8	0·3	0·4
Water, at 110°C.	0·9	2·6	3·0	0·7	4·7	2·1
Water, above 110°C.	8·2	5·4	7·8	9·6	9·1	10·1
Chlorine (Cl) calculated as sodium chloride	0·04	0·16	0·15	0·07	1·42	0·3
Manganese	Trace	Trace	Trace	Trace	Trace	Trace
Gold	Nil	Nil	Nil	Nil	Nil	Nil
	100·24	100·16	99·75	99·97	99·72	100·2

Sample No. 1 was taken from a seam of ochre 2½ft. thick, below the small stope, close to the main crosscut. This sample shows a high content of ferric oxide, but also a considerable amount of free silica, which would probably require to be eliminated to a considerable extent. A high percentage of silica is stated not to interfere with the staining properties of paint, but to reduce its opacity or covering power.

Sample No. 2 was taken from an 8in. seam in the face of the S. drive, and shows the lowest iron oxide content and the highest silica.

Sample No. 3 was taken from two seams of soft ochre, each 8in. wide, occurring in the ochre seam showing in the N. drive. This material is roughly separated by screening when broken from the face. It is also fairly high in silica.

Sample No. 4 was taken from the remaining harder portion of the seam in the face of the N. drive, from the footwall up. It is high in ferric oxide and low in silica.

Sample No. 6 was taken from the ochre seam, 3½ft. thick, where it shows in the underlie close to the second crosscut. This also is high in ferric oxide, and contains little silica.

Sample No. 7, taken farther up the underlie close to the first crosscut, is similar to Nos. 4 and 6. Here the ochre seam is against the hanging wall of the formation.

It will be noted that none of these samples showed the presence of gold.

Another sample, No. 5, was taken from some ironstone in the underlie and assayed, but showed merely a trace of gold.

All the ochre obtained is yellow in color, varying from light or golden yellow to dark or brownish yellow; and, by calcining this natural ochre, various shades of red ochre could be obtained. Minute scales of sericitic mica can be seen in some of the samples.

Manganese, which is generally considered as one of the constituents of sienna and umber, imparting to them a darker color, was not present in any of the samples in appreciable quantities.

Although the valuation of ochres appears rather arbitrary, and not always in accordance with the analysis, yet it would seem that as the ferric oxide is the actual pigment, the value of the ochre depends largely, if not entirely, on the amount of ferric oxide present, provided, of course, that the color and physical condition are satisfactory, and that no objectionable impurity is present.

In this respect Nos. 4, 6, and 7 ochre samples show a very high percentage of ferric oxide, and should be correspondingly valuable to those who require the colors afforded by them.

No. 1 sample, while not so high as these in ferric oxide, is yet of very good grade, comparing favorably with the analyses of many known ochres. There are no objectionable impurities, the other constituents being small percentages of clay and silica.

A small amount of chlorine is shown in the analyses, probably representing a little salt present, but not in sufficient quantity to be harmful.

The usual method of preparing ochres for the market is by crushing and grinding, with levigation. For levigation an ample supply of water is required, and in the present case this can be readily obtained from the main shaft by pumping.

If it is desired to calcine the natural yellow oxide in order to obtain red pigment, an abundant supply of firewood can be obtained in the vicinity. Calcining and levigation processes had formerly been in use at this mine, but no plant is now in existence on the mine for this purpose.

The ore at present is raised by means of a windlass on the main shaft, and stacked in roughly partitioned dumps at the collar of the shaft.

Estimation of Tonnage.—The whole extent of the workings was not accessible at the time of visiting, portion being unprovided with ladders, and some being under water, the only estimation that could be made, therefore, was of the tonnage shown in the workings between the underlie and the main shaft. The generally accepted meaning by mining engineers of "ore in sight" or "developed ore," is "ore exposed on at least three sides within reasonable distances of one another." In this case the exposures are formed only by the crosscut and the small amount of driving done, and the tonnage that can be definitely stated as in sight or developed is consequently small. The block thus proved by the crosscut and the drives, taking the seam of ochre in the formation as averaging 3ft. in width, is 3,600 cub. ft., which at 9 cub. ft. to the ton, gives a tonnage of developed ore of 400 tons.

However, taking into account the extent of the formation on the surface, and the size and comparative regularity of the ochre seam in the formation where it was seen, it is very reasonable to suppose that a large tonnage of ochre will be obtained from this property by further operations.

In extending mining operations, reliance for further tonnage will probably have to be based more on developments at or above water level than at depth, for the deposit being of pyritic origin, the ochre, or oxide of iron now mined, will probably yield to pyrite in depth.

Owing to the abundance of firewood in the vicinity, and the presence of permanent water in the shaft, the preparation of the ochre for market could be economically performed on the mine. (30-3-20.)

REPORT ON THE LADY FRANKLIN MINE.

(*Vide* Record of Mines.)

The property now held under this name consists of mineral claim No. 11127, formerly known as the Lady Franklin, mineral claim No. 11147, adjoining on the north, and formerly known as the Moonlight, and mineral claim No. 11148, adjoining No. 11127 on the west.

These claims are on part sections 153 and 156, in the hundred of Warrow, county Flinders, Eyre Peninsula, and are situated on flat country on the eastern side of the Marble Range, 32 miles from Port Lincoln. The Lady Franklin and Moonlight were prospected over 20 years previously, and from the former lead, gold, and silver minerals, with traces of copper and zinc, are said to have been obtained, and gold was stated to have been obtained from the Moonlight.

No work of any consequence has been done until recently, when a small oil engine and pump were placed on the old shaft at the Lady Franklin, and the shaft was repaired and cleaned out down to the 55ft. level, permanent water level being at 20ft. The total depth of this shaft, which is vertical as far as could be seen, is said to be 82ft. The surface consists of calcareous soil and overburden, and no outcrops can be seen, the only indication of a lode being given by the presence of quartz fragments occasionally showing in the soil.

When previously worked, other shafts had also been sunk, but these are now caved or filled in. The present owners commenced sinking a new shaft close to the existing shaft, but abandoned this work in favor of cleaning out the old shaft.

On the Moonlight claim some prospecting work had been done at one time, but no openings exist now, and all that can be seen is a small dump of ferruginous quartz which probably came from some of the prospecting operations. The surface here also consists of calcareous soil, and no outcrops can be seen.

These old workings are due north from the Lady Franklin workings. On the Lady Franklin, a little to the north of the shaft, a deep costeen has been carried east and west for some distance, but a few scattered fragments of white massive quartz are all that can be seen.

Underground Workings.—The shaft is about 5ft. by 3ft., and is vertical. At a depth of 47ft. a small drive had been started previously, and this was advanced a little by the present owners. A crosscut was then started, and driven through the formation from the hanging-wall to what appears to be the footwall. The formation consists of massive bluish quartz, carrying a certain amount of iron oxide, limonite, in places, and mixed to some extent with white talcose material. The lode formation has a strike of N. 55° E., and dips to the south-east at a steep angle. Beyond the footwall the crosscut has penetrated a few feet of soft decomposed country rock. In this crosscut, a few feet in from the drive, the lode in the bottom shows some galena associated with the quartz. At a depth of 55ft. another small opening off the shaft was found, where the lode had been broken into for a few feet. A general sample was taken from here and assayed, with the following results:—

Sample No. 5, consisting of quartz—Gold, 1dwt.; silver, nil; lead, nil.

The lode formation which shows for 20ft. along the crosscut on the 47ft. level was sampled in four sections commencing from the hanging-wall, with the following results:—

Sample No. 1, consisting mostly of quartz, width 5ft.:—Gold, trace; silver, 4dwts.; lead, 1.4 per cent.

Sample No. 2, consisting mostly of quartz, width 5ft.:—Gold, trace; silver, 2dwts.; lead, 0.1 per cent.

Sample No. 3, consisting of quartz with some decomposed schistose material, width 5ft.:—Gold, trace; silver, nil; lead, nil.

Sample No. 4, consisting of quartz with some decomposed schistose material, width 4ft. 9in.:—Gold, trace; silver, nil; lead, nil.

The analyst, Mr. W. S. Chapman, makes a note that none of the samples showed the presence of zinc, but that Nos. 1 and 2 showed traces of copper.

The formation is thus seen to be about 20ft. in width where sampled, but although the presence of gold, silver, and lead is shown by the samples, none of these minerals are in sufficient quantity to be profitable. Galena can be seen in places, but would have to be present in very much larger quantities before it would pay to work. The silver appears to be associated with the galena, and the amount of gold is merely sufficient to indicate its presence.

The amount of work done is not considerable, and it might be as well to test the formation at one or two other points. For this purpose, the simplest way would be to drive in the soft country alongside the lode at the 47ft. level, keeping the wall of the lode as the wall of the drive, and then to crosscut the lode at one or more points, say 50ft. apart, thus obtaining information as to the nature of the lode at different points. Alternatively some work might be done in the lode itself where the galena is seen to occur, to ascertain whether this appears likely to improve either way along the lode. —(31-5-20.)

REPORT ON THE MOUNT BURR PHOSPHATE AND GUANO MINE.

This property consists of two claims, mineral claims Nos. 11169 and 11376, situated about half a mile east of Burr Well and a quarter of a mile north of Burr or Fink Creek, and distant 19 miles in a direct line north-east from Copley Railway Station, with which there is communication by road.

The phosphatic rock and guano are found in a series of caves or solution fissures in a dolomite formation, which at this point rises to a considerable height above the bed of a small creek, the entrance to the caves being 10ft. or 15ft. above the creek level. Evidently in the past these caves have formed a refuge for various animals, birds, or bats, and they now contain considerable deposits of guano mingled with the bones and skeleton remains of these creatures. The caves are very irregular in shape and occurrence, the maximum width seen being 11ft., and the cavities are filled or partly filled with guano and bones and fragments of dolomite from the roofs and sides. Some of the guano, owing to the action of water, has penetrated seams and fissures in the dolomite, and shows as black masses or stains on the cliff face. The dolomite walls and debris of the caves, owing to contact with the guano, have in part become phosphatized, forming a phosphatic rock, and this material may in places contain sufficient phosphates to be worth recovering.

The caves appear to extend irregularly for a considerable distance, and there is the possibility of further extensions of these fissures, which may be found in removing the deposit and by further exploration. Owing to the irregular shape of the fissures, and the depth of guano in them being unknown, it is not possible to make any estimate of the quantity of guano to be obtained. This matter is also complicated by the fact that debris from

the walls and roofs of the caves may be mistaken for the floor of the cave, although really lying on top of the accumulation of guano. However, as far as could be judged, there appeared to be a considerable quantity of fertiliser to be obtained, and, of course, there is the possibility that in working the caves may be found to extend farther than can be seen at present and others may be discovered.

A sample of the guano and some samples of the dolomite in or adjacent to the caves were taken, and submitted for analysis to Mr. W. S. Chapman, who gave the following results for them:—

Guano—

Phosphoric acid	10.85 per cent.
Equivalent to tri-calcic phosphate	23.68 " "
Nitrogen	1.00 " "
Potash (water soluble)	1.60 " "

No. 1 Sample.—Limestone and phosphatic rock, soft, from within the cave—

Phosphoric acid	12.30 per cent.
Equivalent to tri-calcic phosphate	26.85 " "
Insoluble matter	11.00 " "

No. 2 Sample.—Siliceous rock phosphate and limestone from within the cave, resembling coarse, soft sandstone—

Phosphoric acid	5.84 per cent.
Equivalent to tri-calcic phosphate	12.75 " "
Insoluble matter	73.70 " "

No. 3 Sample.—Siliceous limestone with quartz crystals, from cave—
Phosphoric acid ..... trace

No. 4 Sample.—Dolomite and quartz, dolomite somewhat cellular, from a ledge outside the cave—
Phosphoric acid ..... trace

At present the method of obtaining the guano is rather awkward, owing to the irregular nature of the caves, but the present owner intends to drive into the caves from the face of the cliff, to get easy access and to improve the ventilation.

Wagons can pull up under the cave entrance, and the bagged guano is delivered on to the wagons by means of a shoot. It has then to be carted into Copley Railway Station, and thence consigned by train, the rail distance to Adelaide being about 370 miles.

The guano, which is in the form of a light brown powder, is easily and cheaply got, only requiring to be filled into bags.

A considerable amount of loose phosphatic rock occurs with the guano, and the rock forming the sides of the caves is more or less phosphatized, but as far as is shown by the analyses, this phosphatic rock is not sufficiently high grade to be of value. Material free from objectionable impurities, and containing 60 per cent. of tri-calcic phosphate, is worth about 35s. per ton at the superphosphate works, and the lower limit of saleable phosphatic rock is about 50 per cent.

Under these circumstances it would be preferable to screen out the rock from the guano, as the latter is of value mainly for its nitrogen and potash content, and in a lesser degree for that phosphate forming an integral part of the finely-divided guano substance. On the other hand, the phosphatised rock is of value only for the tri-calcic phosphate content, and in this case, as far as the analyses show, it is too low grade to be saleable, and merely acts as an adulterant, reducing the value of the guano.—(3-8-20.)

REPORTS

BY

The Inspector of Mines (H. Jones).

WALLAROO MINES.

Detail examinations of the workings have been made and reports furnished —12/2/20, 24/5/20, 11/6/20.

MOONTA SYNDICATE COPPER MINE (Wallis and Party).

Block No. 2, adjoining and north-east of the Moonta Leases.

The underlie shaft is down 130ft. At that depth a drive N.E. has been put in for 47ft., the last 12ft. nearly east in direction. High-grade sulphide ore, from 1ft. to 2ft. thick, was exposed along the hanging-wall, with quartz and iron pyrites on the footwall. The formation in the face of the drive is about 3ft. 6in. in width, and appears very promising. A winze has been started in the ore shoot to prove it at a greater depth. At the 90ft. level in the N.E. drive 30ft. from the shaft a winze has been carried down to within 10ft. of the lower level. A parcel of ore for the smelters is being dressed on the surface.—(29-3-20.)

The N.E. drive in the ore channel at the 130ft. level has been extended to 88ft. from the shaft. The lode formation consists of quartz and rock from 1ft. to 3ft. wide, but shows no copper ore in the present face. The shoot of sulphide ore at 35ft. shows a length of about 25ft., and at the S.W. end a rise has been put up to the winze in the higher level. Stoping is in progress, and about 20 tons of material broken down. The workings are safe and in proper order.—(20-8-20.)

HICKS AND HOOPER'S COPPER MINE.

(*Vide* Reviews Nos. 9, 10, 13, 16, 24, 28, 29, and 31.)

Block No. 1, portion of the Yelta, near Moonta.

At the 40-fathom level in the main underlie shaft the N.E. drive on the course of the lode formation has reached a distance of 420ft., the last 20ft. being in country rock. The shoot of ore in the drive at this level is much longer than in the levels above. Ore of good quality was found in the drive at 180ft. from the shaft, and the shoot has continued for 220ft., up to 400ft., without a break. The formation in places along the drive shows a width of from 4ft. to 8ft., carrying small seams and bunches of ore throughout, and one solid seam of high-grade sulphide ore 1ft. to 2ft. thick near the hanging-wall. At the southern end of the ore shoot 180ft. from the shaft a winze has been sunk 40ft. in lode formation from 4ft. to 5ft. wide, containing seams of high-grade sulphide ore associated with high-grade ore and pyrites; the lode seems going down strongly and extending southward.

Main Shaft, 25-fathom Level.—The N.E. drive is now in a total distance of 320ft. Driving has been discontinued for the present, and a start made to stope out the ore south from No. 2 winze; the ore body is from 1ft. to 2ft. thick, of fairly high-grade copper pyrites. At 200ft. from the shaft a winze has been sunk in the ore shoot down to the 40-fathom level. About 120 tons of ore have been marketed from this place.

Main Shaft, 15-fathom Level.—The N.E. drive is completed for a distance of 560ft. up to the new shaft, and 20ft. of driving has been done N. from the shaft. The new shaft has been properly timbered down to the 15-fathom level, and sinking will be carried down to the 40-fathom level. The workings are in good and safe condition.—(5-5-20.)